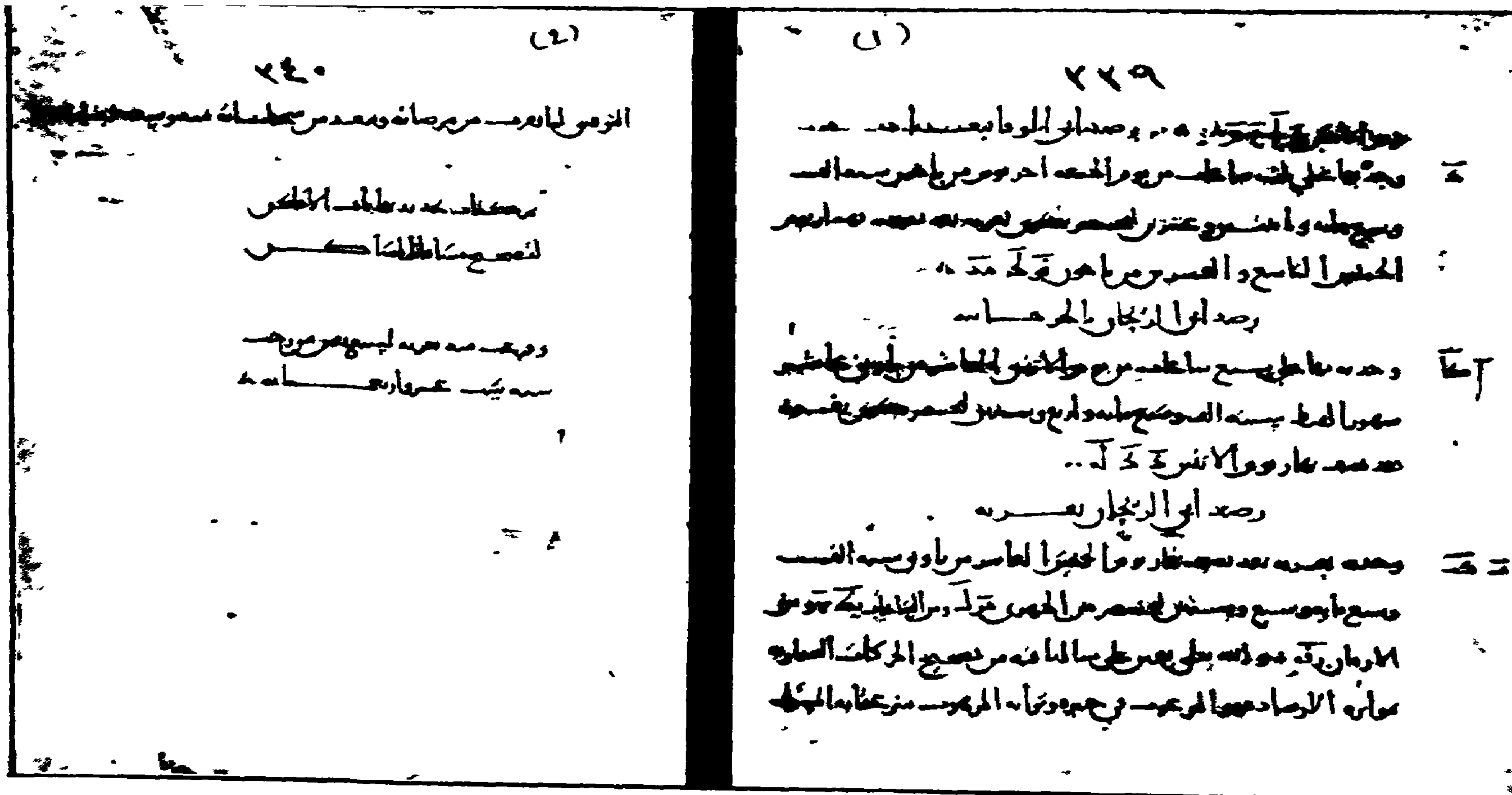
AL-BĪRŪNĪ
COMMEMORATION VOLUME



Facsimile of Al-Biruni's handwriting.

(By Courtesy of ISLAMIC CULTURE, Hyderabad)

AL-BĪRŪNĪ
COMMEMORATION VOLUME

A.H. 362—A.H. 1362

IRAN SOCIETY
159-B DHARAMTALA STREET
CALCUTTA

BA-YAD-I-ALBERUNI

By

KHAN BAHADUR REZA ALI *WAHSHAT*

ساد البروی

ر البیروی مسب داسـاں گو   بهر حا داسـاں ىاسـاں کو
وحودس مانهٔ صد ىار ابراں   حراغ هند ار ىورس فروراں
حوسا دکری که ار هندوساں کرد   بهاں ىود آىحه ار هر کس، عىاں کرد
ر هر علمِ حهاں او ىا حىر ىود   ىساں اهلِ عالم ىا اىر ىود
حهاں روس ر علم و حکمب او   بهر حاطر حىال حُرمب او
علـوم مسرقـه حاری ار وی   حوسا کمی ىدلها طاری ار وی
الٰهی رحمتی بر حاکِ او کں   کراسها نحاں ىاکِ او کں

رضا علی وحسـب (کلکته)

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FACSIMILE OF AL-BIRUNI'S HANDWRITING
(By Courtesy of *Islamic Culture*, Hyderabad)
In Frontispiece

FOREWORD

The Iran Society of Calcutta deserves indeed our warm felicitations on having embarked on the rather difficult yet noble mission of bringing out "Al-Biruni Commemoration Volume"

Already this society has extorted the genuine admiration of lovers of Culture all over India and Iran by trying to open paths in the field of high research, and by disseminating the light of the past amongst the modern advocates of science and literature

It was therefore with a deep sense of joy that I set myself to write a few lines by way of a foreword to this monumental volume on Al-Biruni

I regard Abu-Raihan Al-Biruni as one of the clearest thinkers, one of the gentlest natures and one of the best characters to figure prominently in the chronicle of Man

Mathematician, astronomer, geographer, historian, philosopher, Al-Biruni should be looked upon as one of the greatest masters of all times and ages

Few personalities of the history of science have fascinated the posterity as much as has the great Al-Biruni

The Shaikh's disinterested pursuit for Truth his restlessness as a perturbed spirit, his breadth of mind, his versatility of genius, his vision, his unbounded love for human Culture are and will remain for ever as beacon lights for the caravan of a misguided humanity

He has much to give us today We must earnestly endeavour to scale the heights which he had so well attained in his time We must shed off narrow-mindedness, short-sightedness and all the fissiparous tendencies against which the great master waged a relentless war all through his life

I am sure the volume published through the zeal and commendable initiative of Iran Society will help raise the Supreme Savant to his full stature before the modern world whose scientific spirit had been so fully imbibed by the great Al-Biruni

M Noury-Esfandiary,
Ambassador for Iran, New Delhi

INTRODUCTION

It is the privilege of the IRAN SOCIETY of Calcutta to have drawn the attention of the scholars of the world to the millenary (Anno Hegirae) which elapsed since the birth of Sheikh Abu Raihan AL-BIRUNI, the 'Master Aliboron' of the mediaeval West

Al-Biruni was born in Dhu'l-Hidjdja 362 or according to the Christian Era in September, 973, he died on the 3d Radjab 440 corresponding to December 13th, 1048 In 1948 there were therefore nine hundred years that the Sheikh had died, and it was first proposed to call the celebrations to be held in his honour 'AL BIRUNI'S NINTH CENTENARY' But it was pointed out that if the years were counted according to the Muslim way, a little over one thousand hegira years had passed since the hero's birth Dhu'l-Hidjdja 1362 fell in December 1943 Since *minimum pro nihilo reputatur* and Al Biruni himself surely reckoned the days of his life in lunar months and hegira years, it was decided to call the planned celebrations 'AL-BIRUNI'S MILLENARY'

It was in 1946 that the Council of the IRAN SOCIETY were making plans to honour the memory of a man who so well symbolizes the cultural aims of the Society An 'Al-Biruni Celebrations Committee' was formed under the able chairmanship of the first Patron and President of the Society, Dr B C Law, M A, B L, Ph D, D Litt, F R A S (Lond), F R A S B The other members of the Committee were Prof Dr B M Barua, M A, D Litt (Lond), Dr M Ishaque, B Sc, M A, Ph D, Honorary Secretary of the Iran Society, Mr Percy Brown, M B E, A R C A, F R A S B, Prof Dr Suniti Kumar Chatterji, M A, D Litt (Lond), F R A S B and Rev Fr V Courtois, S J, the Secretary to the Committee

The plans foresaw an international convocation of Orientalists, an exhibition of works of Al-Biruni and things connected with his researches, series of popular lectures, some social entertainments and some publications adapted to the circumstances But the hopes and plans of the Committee were frustrated by the unfortunate situation which developed out of the partition of India Communal tension in Calcutta and in the rest of India precluded the possibility of holding cultural celebrations at the time The attention of the public was then diverted towards the big and urgent problems confronting the newly born Nation reorganization of the administration, the procurement of food, rehabilitation of refugees, international relations, etc The 'Al-Biruni Millenary' had perforce to be postponed till better days

As part of the celebrations it had been resolved to prepare an AL-BIRUNI COMMEMORATION VOLUME The task of

gathering the material for the book was entrusted to the Secretary of the 'Al-Biruni Celebrations Committee' Scholars all over the world were approached for literary contributions to the volume, a generous and gratifying response was received Besides several scholars of India, leading Orientalists of England, the United States of America, Italy, the Netherlands, France, the Vatican City and Iran sent in original and valuable articles on various aspects of the intellectual and scientific achievements of Abu Raihan an international tribute of admiration to the genius of a great Muslim who by his disinterested scholarship belongs to the whole world

With pride and pleasure the IRAN SOCIETY presents today to the public the *Al-Biruni Commemoration Volume*

The Committee thank the Orientalists who have contributed to the success of the undertaking We thank Hon'ble Maulana Abul Kalam Azad, Minister for Education in India, for the special interest shown in the work and for the step taken to help covering the heavy expenses incurred by the publication of the book We thank our former President Dr B C Law under whose aegis the work was begun and whose encouragements have always been much appreciated We thank the Managing Editor of the *Islamic Culture* of Hyderabad for having kindly allowed us to reproduce a plate of Al-Biruni's handwriting published in the October 1932 issue of the review, Rev Fr F Goreux, S J, Professor of Mathematics at St Xavier's College, Calcutta, for the neat drawing of the diagrams illustrating some of the articles, Prof A A Khan Bekhad, M A, for compiling the Index of the Persian and the Urdu papers, and the Superintendent and Staff of the Baptist Mission Press, Calcutta, for the patience and thoroughness with which they tackled a difficult and exacting job

Biographical details on Al-Biruni and an appraisement of his work will be found in the various chapters of this book, but it may not be out of place to recall here the main data of the life of the great Sheikh to serve as a broad frame in which to fit the studies that follow

ABU'L-RAIHĀN MUHAMMAD IBN AHMAD AL-BĪRŪNĪ—or perhaps more correctly 'Bērūnī'—was born of Iranian stock in the month of Dhu'l-Hidjdja 362/September 973 in the territory of Khiva, a Khanate of Turkistan in Central Asia, now part of the U S S R Khiva was then known as Khwārizm, hence Al-Biruni is sometimes called simply '*al Khwārizmī*' by Arabic authors such as Yaqut He was a Sunni Muslim by conviction with Ismailian sympathies in religion and universalist tendencies in philosophy.

Khwārizm had in former days been the centre of an old culture which is gradually coming to light Imposing ruins were in recent times discovered in the country around by Prof S P Tolstov, already in the beginning of this century when visiting Al-Biruni's

birthplace Prof V Minorsky had been impressed by the ancient system of irrigation he had found there

Although Al-Biruni, who had fallen under the spell of Arabic, wrote rather disparagingly of his mother-tongue —an Iranian dialect of the North with strong Turkish influence—yet there seems to have been some interesting literature in old Khwārizmian The language itself was deciphered by Prof W Henning of London and Prof A Freiman of Leningrad, written documents in old Khwārizmian are increasing in number, Prof Tolstov discovered 81 of them in 1948

Al-Biruni wrote a history of his own mother-country, the 'History of Khwārizm' where he gives a long list of local rulers, the names of some were discovered on old coins of the place Unfortunately this work is known only through quotations

Throughout his life Al-Biruni showed an ever growing interest in the exact sciences, and in fact in every field of knowledge He studied mathematics, astronomy, medicine, chronology and history, and in all these branches he became a master and a creator He was a contemporary of Ibn Sina with whom he corresponded and he must have known the cruel disappointment of Firdausi at the court of Mahmud of Ghazna

Al-Biruni's first great work was the *Kitāb al-Āthār al-Bāqiya 'an'il-Qurūn al-Khāliya* which Edward Sachau edited (Leipzig, 1878) and then translated into English under the commonly known title of 'Chronology of Ancient Nations' (Or Transl Fund, London, 1879)

The Sheikh's vast knowledge and sound judgment won him the favour of the ruling prince of Khiva who appointed him a councillor at court But the policy of the Ruler of Khwārizm displeased so much his powerful neighbour of Ghazna, Sultan Mahmud that the latter invaded Khiva, annexed the land and took as hostages to Ghazna the leading men of the defeated country Among them was Abu Raihan Al-Biruni All this happened in 1017

Al-Biruni's 'captivity' in Afghanistan proved beneficial both for him and for culture in general His reputation as a *munadjdjim* opened to him the gates of the palace and attracted attention on his usefulness, he seems not, however, to have filled any official post at the Court of Mahmud

The proximity of India which Mahmud Shah's campaigns had just opened to Islam, exercised a strange fascination on Al-Biruni's mind, he longed to visit the mysterious continent and to penetrate its secret He crossed therefore into India where he stayed for several years teaching the Greek sciences and acquainting himself with Hindu lore He learned Sanskrit that he might go to the sources of Hindu thought, he read with delight the *Bhagavad Gita*, he studied Samkhya of Kapila, the book of Patanjali and acquainted

himself somewhat with the Puranas, he quoted abundantly from those works and from others in his own writings

For a Muslim living in the days of Sultan Mahmud, almost under his roof, to study Sanskrit and things Hindu was no mean achievement, it demanded an exceptional spirit of determination and perseverance and not a little audacity 'I found it very hard', he confessed in the *Tahqīq*, 'to work my way into the subject although I have a great liking for it in which respect I stand quite alone in my time, and although I do not spare neither trouble nor money in collecting Sanskrit books from places where I supposed they were likely to be found, and in procuring for myself, even from remote places, Hindu scholars who understand them and are able to teach me' (Ed Sachau's *India*, Trubner, Vol I, p 24)

The fruits of Al-Biruni's researches in Hindustan are consigned in his well-known *Tahrīr* (or *Tahqīq*) *mā li'l Hind min maqāla maqbūla fi'l-'aql au mardhūla*, more usually referred to as *Tārīkh'al-Hind* or *Indica* It was also Edward Sachau who edited the text (London, 1887) and translated the masterpiece into English (London, 1887, new edition, 1910)

When Al-Biruni returned to Ghazna he set himself to write an exhaustive account of the science of astronomy and dedicated his work in A H 421/A D 1030 to Sultan Mas'ud ibn Mahmud, hence the book's name *Al-Qānūn al-Mas'ūdī fi'l-Hai'a wa'l-Nudjūm* The *Qānūn* is considered as one of the most important works of Al-Biruni, but owing to technical difficulties the original text of it has not been edited as yet, and only fragmentary translations have so far been attempted

Besides these three great studies, Sheikh Abu Raihan wrote scores of smaller ones on a variety of subjects the *Al-Tafhīm li Awā'il Sinā'at al-Tandjīm* a popular introduction to astronomy and astrology in the form of questions and answers, *Istī'āb al-Wudjūh al-Mumkina fī San'at al-Asturlāb*, a work on the astrolabe, its manufacture and use, *Kitāb al-Djamāhir fī ma'rifat al-Djawāhir*, an opuscule on mineralogy and the study of gems, the *Kitāb al-Saidana fi'l-Tibb*, a kind of materia medica of his days, Yaqut refers also to a book on literary criticism, and it is said that the Sheikh wrote some verse, but it was surely not much in his line According to C Brockelmann (Geschichte der Arabischen Litteratur, Suppl I, pp 870 ff) some 27 works of Al-Biruni are extant to this day, but there are references to many more In fact it is said of the great Sheikh that if all the books he wrote (more than 114 ?) were gathered into a bundle they would exceed a camel's load !

Abu Raihan died at Ghazna at the ripe old age of 75 on Radjab 3d, 440 which corresponds to December 13th, 1048

Al-Biruni was one of the most versatile and thorough scholars whom the Middle Ages have known. His passion for truth, his

spirit of work undaunted by difficulties of any sort, his intellectual fairness, his sincere religious convictions, make of him a most attractive personality All this will be borne with telling force by the papers contributed to this volume, which we presume, now, briefly to summarize

The first article by Janab Syed Hasan Barani of Bulandshahr is a part only of the author's unpublished work on MUSLIM RESEARCHES IN GEODESY With his kind permission we culled from that work what had more direct reference to Al-Biruni's contribution to the science of Geodesy

Mr Barani is a great admirer of Sheikh Abu Raihan whom he never ceased to study since his college days He wrote in Urdu a much appreciated biography of Al-Biruni which has known two editions, and he contributed many learned articles to oriental reviews

The astronomers of ancient Greece and India already knew that the earth is a globe and they even tried to calculate its actual dimensions, but although their efforts were praiseworthy, the results arrived at lacked both in precision and accuracy The Muslim astronomers, then, took up the task and by devising new methods of experimentation and calculation they were able to make very satisfactory measurements of the earth Much credit must go to the scholars employed by the Caliph Al-Mamun who in the first half of the IXth century A D had the full length of an arc of the meridian measured on the surface of the earth

In the early XIth century, Al-Biruni, who took nothing for granted, first resumed and checked the calculations so far made, then, forging far ahead, by means of abstruse trigonometrical calculations he worked out the entire length of the radius and of the circumference of the earth His were the most accurate results arrived at until modern times, his measurement of the earth's radius was short by less than 12 miles, and the one of the circumference of the globe by about 70 miles only!

The records of the calculations that were made by Al-Mamun's astronomers are lost, only some reference to them is found in various books Mr. Barani has very painstakingly put together and discussed all the data he could find on these early computations From Al-Biruni's writings four different versions are obtained of the measurement of the arc of the meridian by Al-Mamun's scientific staff, they are found in the *Tahdīd* the *Kitāb al-Tafhīm*, and in two places of the *Qānūn al-Mas'ūdī* The other sources of information on the subject are the *Biographical Dictionary* of Ibn Khallikān, the *Kitāb al-Tanbīh* of Al-Mas'ūdī and the *'Aīn-i-Akbarī* of Abul Fazl.

Mr Barani has taken the trouble of verifying the calculations made by Al-Biruni and of expressing them in miles and feet He also discussed the results arrived at in the light of modern scientific researches

The second article of the volume, L'INDIA VISTA DA DUE GRANDI PERSONALITA MUSULMANE BABAR E BERUNI, is a fine study in psychology Professor Alessandro Bausani of the University of Rome compares with much tact and acumen the reactions of two great Muslim personalities before the old civilization of India, he studies them in the context of the *Tārīkh Al-Hind* and the *Bābārnāmāh*

Five hundred years separate Emperor Babar from Al-Biruni, the India they saw was considerably different In the time of Babar a big portion of the country had been islamized, and then Babar was able to travel far and wide in the sub-continent Al-Biruni's India had scarcely been touched by the Faith of Islam, and he saw of it probably only the Punjab and some adjacent districts (Both, however, Babar and Al-Biruni have tried to understand India and they wrote of it with much sympathy and admiration) Both also remained very personal in their appreciation of the Indian culture and—a rather noteworthy and praiseworthy feature in travellers' relations of the past--there is no plagiarism Babar did not plunder the *Indica* to stuff his *Bābārnāmāh*

The point of view of the men were very different Babar was subdued by the physical beauty of India and records what he sees or what he hears without enquiring much into the 'why' of anything Al-Biruni on the other hand was always haunted by the religious or philosophical aspect of things Both do describe the same objects, for instance, the rhinoceros, or the monkey, or physiographical details of India, its rivers, its mountains and many other things but what a difference in the result arrived at! Babar's picture is like a faithful photograph reproducing the exact contour of the thing, Al-Biruni's picture is an X-ray of the object, less colourful but deeper in its attempt at finding the *raison d'etre* of it all Babar is interested in facts, Al-Biruni looks for theories and explanations This natural bias is found in all the subjects they described whether it be geography or fauna or flora, religious practices or dancing or superstitions / To classify the types of the two writers, concludes the Author, one might perhaps, using the terminology of the psycho-analyst C G Jung, see in Al-Biruni 'un tipo introvertito' and in Babar 'un estrovertito'

In AL-BIRUNI AND THE RAMA KATHA Rev C Bulcke, S J, Professor at St Xavier's College, Ranchi, tells us what Abu Raihan knew of the Rama story The *Ram-Katha* (*Utpatti aur*

Bikas) or Rama Story is an extensive study written in Hindi of the Rama Legend, the thesis, thorough and exhaustive, earned for its Author the Doctorate in Hindi Literature and Language from the Allahabad University Al-Biruni, contents the Author, seems not to have read nor even seen a copy of the *Ramayana*, yet he managed to acquire a remarkable knowledge of the deeds of the hero of the great epic and of the authorship of the work itself, he knew that it had been composed by Valmiki, a contemporary of Rama Dr Bulcke has carefully gleaned from Al-Biruni's *Indica* all the references to Rama and he has analyzed them briefly

AL-BIRUNI AND SANSKRIT by Professor Dr Suniti Kumar Chatterji of the Calcutta University, shows the special value of Al Biruni's work on India from the point of view of philology and Sanskrit The writer thinks that Abu Raihan may have picked up some Sanskrit already at Ghazna from Hindu captives and settlers, this helped him considerably when later he came to India His knowledge of Sanskrit was perhaps not very profound, but it was 'wide enough and practical', and he could make intelligent use of the Pandits and Sastris whom he engaged from time to time

From Al-Biruni's *Indica* can be gathered some 2 500 Sanskrit words in Arabic transcription, valuable data from which can be determined to a certain extent the phonology of Sanskrit in North India in the XIth century The Sheikh knew enough Sanskrit to translate or at least to check carefully translations made by Pandits under his guidance of the Elements of Euclid the Almagest of Ptolemy, and a work of his on the Astrolabe 'Unfortunately all trace of his translation is lost'

Close contact with India developed in Al-Biruni a real love for the country and its venerable culture Prof S K Chatterji appreciatively writes about the great Sheikh In outwardly a very small but very highly significant matter it seems that we can see Al-Biruni in the *rôle* of a translator into Sanskrit, as a lover of India and Indian culture, and at the same time a practical supporter of the principle of self-determination among peoples'

Was it not most likely due to the influence of the Muslim Sanskrit scholar that Mahmud of Ghazna who surely was not over-soft with the 'idolator' Hindus,—should have issued in India bilingual coins with the usual Arabic legend on the obverse rendered in Sanskrit on the reverse the *kalima*, the name and title of the ruler, the place and date of minting? It is particularly interesting to see the rendering of technical Arabic religious terms into a Sanskrit garb Allāh-*Avyakta*, Rasūl'Allāh-*Muhammada avatāra*, Hidjrat'al-Nabi-*Jināvana-samvati* (in the year of the passing of the prophet, jina), or *Tājikīyera-samvatī* according to the reading of Dr Vasudeva Śarana Agravāla, Bism'Illāh-*Avyaktīya-nāme*

For Al-Biruni alchemy was a quasi-science invented by greedy men in their lust after easy money But right or wrong alchemy did occupy the attention of many people and played its part in the birth of modern chemistry Alchemy was popular in India as elsewhere in the days of Sheikh Abu Raihan In a faithful account of India's culture Al-Biruni had to give at least some sidelights on Indian alchemy Monsieur Jean Filliozat, the able Secretary of the Société Asiatique, Paris, has put together the bits of information given by Al-Biruni about alchemy in India The title of the article is AL-BIRUNI ET L'ALCHIMIE INDIENNE

Because of the esoteric nature of alchemy and the reluctance of the alchemists to communicate their secrets to the uninitiated, Al-Biruni found it difficult to penetrate deep into the mysteries of Indian alchemy Yet he gathered some precious notes on the Indian legends about alchemy such as the story of the Raja of Shara and the oil bath that was to give him immortality

Al-Biruni tried to find out the origin of alchemy in India He mentions somewhere a certain Vyadi who practised the science at Ujjain during the reign of Vikramaditya, the founder of the Vikrama Era in B C 57 He does not affirm that Vyadi invented the 'science' since Vyadi himself made use of a book on alchemy which he misinterpreted, but he may well have been close to the beginnings

Professor Francesco Gabrieli of the University of Rome takes the reader away for a while from Sanskrit and from India to show us Al-Biruni and the Greeks in LE CITAZIONI DELLE *LEGGI* PLATONICHE IN ALBIRUNI

The Arabic translations of Plato's Greek works were as a rule little reliable, they were paraphrases or commentaries of the original rather than true translations Professor Gabrieli tries to determine what Arabic text Al-Biruni used in his quotations of Plato's *De Legibus* was it also a paraphrase or a relatively faithful translation? The Author selected seven quotations from the *De Legibus* in the *Tārīkh'al-Hind* and compared them with the same quotations found in the summary of the Greek Philosopher's work made by Al-Farabi From this comparison it is clear that the text used by Al-Biruni was no mere paraphrase of the book of Plato, but a real, though at times somewhat free, translation of the same Whose text it was is difficult to surmise, the Author suggests the names of Hunain ibn Ishāq or of Yahya ibn 'Adi, both mentioned in the *Fihrist*

Professor Dr J Gonda of Utrecht takes us back to Sanskrit with a well documented study REMARKS ON AL-BIRUNI'S QUOTATIONS FROM SANSKRIT TEXTS

In the *Tārīkh'al-Hind'* Al-Biruni gives the list of 18 Purānas, but he apparently consulted only parts of the Matsya, the Āditya, the Vâyu and Vishnu Purānas and the Vishnu dharmottara Now according to Ed Sachau, the quotations which the Muslim scholar makes from these works do not always tally well with the texts in our possession

But Ed Sachau was writing over sixty years ago and many new Sanskrit texts have been discovered since then In the light of those discoveries and modern research, Prof Gonda goes over Al-Biruni's quotations carefully and he is able to point out in several instances to the correctness of Al-Biruni's text and so revise some of the notes and remarks of Ed Sachau 'It would appear to me that the learned translator (of the *Tārīkh'al-Hind*) has put too many question marks in his commentary Now that we have more texts at our disposal and have gained deeper insight into the Puranic traditions and the history of this kind of literature, it is possible to give some additions and to propose some corrections on his notes In most cases these corrections remove any doubt as to Al-Biruni's accuracy and familiarity with the texts which he consulted'

The Author studies especially the names and number of Hells mentioned in the Vishnu Purāna and quoted by Al-Biruni, also the list of the different peoples inhabiting Bharat

One detail which at first misled the Western scholars was Al-Biruni's transliteration or cutting of proper names of places (*Sālvāni Pojjhāna* for *Salvā, Nipā, Ujjihāna*) another stumbling-block were omissions or transpositions in the nomenclature of proper names, but then the native authors of those days were not always very particular nor accurate about transliteration and position

Prof Gonda on the strength of critical examination of the context of those quotations vindicates the accuracy of Al-Biruni in many instances, and finds that his readings 'are even of value to those scholars who apply themselves to the study of Puranic traditions'

The Rev H Heras, s j, the Director of the Indian Historical Research Institute of Bombay, considers THE ADVAITA DOCTRINE IN ALBERUNI Although Abu Raihan does not mention in his *Tārīkh'al-Hind* any Vedantic author, 'yet while delving into the nature of God he clearly explains the foundation of the Advaita School'

In a very original and important article Prof Dr Arthur Jeffery of the Columbia University, New York, studies AL-BIRUNI'S CONTRIBUTION TO COMPARATIVE RELIGION The importance of Al-Biruni's contributions to the more strictly scientific disciplines has tended to obscure the fact that he stands

unique in his age, and perhaps unique in the history of his own faith, for his contributions to the study of Comparative Religion'

The gathering of facts and information about religions other than one's own is very old indeed, instances are found in Mesopotamia and in Greece, among the Romans and even among the Muslims before Al-Biruni (see Al-'Ash'ari's *Maqālāt al-Islāmiyn*, and the writings of al-Ya'qūbī and al-Mas'ūdi and others) But what interests us in Al-Biruni is less what he can teach us about other faiths, which we surely know better than he, but it is the method he followed in his investigations

As Al-Biruni himself confessed, 'he was led to write down his observations on the religions, customs and beliefs of the Hindus, at the instance of Abu Sahl of Tiflis on the ground that he discovered that most of the available literature on the subject of the non-Muslim religions sadly misrepresented those religions, both because of inadequate acquaintance with source material, and because of a highly prejudiced attitude towards the religions they were describing'

Al-Biruni adopted in his research a comparative method which he based on original and reliable information He set himself as guiding principles to aim at completeness, accuracy and unprejudiced presentation of other faiths He would use all the available means to that end such as the 'careful examination of witnesses to ascertain what value their evidence has', and an exacting criticism of the evidence given

But the obvious is not always the simplest The attainment of the ideal chosen was fraught with technical difficulties How, indeed, to explain to the adherents of Islam the more difficult and subtle tenets of a faith totally alien to Islam without betraying or belittling their content and without antagonizing the easily prejudiced reader Al-Biruni realized all the import of a correct terminology to fulfil his purpose and one of the most laudable achievements in this field is to have endeavoured always to thoroughness and accuracy We may in this connection refer to the paper on 'Al-Biruni and Sanskrit' by Prof S K Chatterji

After explaining the methodology of the great scholar in his presentation of other religious disciplines, Prof Jeffery records some of Al-Biruni's theoretical discussions on certain general problems of religion such as Idolatry the Force of the Sunna, Cosmologies, Demons, etc

In a third section the writer summarizes the information given by Al Biruni on the great religions of the world and some sects of his days Hinduism, Buddhism, Zoroastrianism, Manichaism, the Greek religion, Judaism, the Samaritan Faith, Christianity, the beliefs of the Sabians and the Khwārizmians, Arabian Paganism and finally Islam

Prof Jeffery based his extensive and well-conducted study on Al-Biruni's *India* and his *Chronology*, but it suffices to show the unique place Abu Raihan holds in the history of that fairly modern branch of knowledge, the Comparative Study of Religion 'It is rare until modern times to find so fair and unprejudiced a statement of the views of other religions, so earnest an attempt to study them in the best sources, and such care to find a method which for this branch of study would be both rigorous and just. Might it be after all that his greatest contribution to learning was not in the field of the more exact sciences but in this field of the sciences of the spirit?'

The purpose of the paper on AL-BIRUNI AND TRIGONOMETRY by Janab M A Kazim, Lecturer in Mathematics at the Muslim University of Aligarh, 'is to give a critical estimate of the merits of the Third Book of the *Qānūn-i-Mas'ūdī*' The Author is of opinion that it is Al-Biruni and not Nasiruddin at-Tusi—as Brahmmuhl believes—who was the first to approach trigonometry as an independent subject The book in question is all about trigonometry, plane trigonometry in the first chapters and spherical trigonometry in the last two chapters, there are also trigonometrical tables

Mr Kazim gives in detail the contents of the various chapters of the book and points out the systematic way with which the great scientist handled his subject To him 'goes the credit of, for the first time, keeping it (trigonometry) independent of astronomical calculations' Nay more Al Biruni may well have been the inventor of calculus of finite differences But the formulae derived by Al-Biruni seemed to have gone into the background till they appear again in the 17th century of the Christian Era in a modified form'

Many mathematical treasures lie hidden in the pages of the *Qānūn-i-Mas'ūdī* which still awaits to be scientifically edited and translated The author hopes with many that the day will soon dawn when Al-Biruni's greatest mathematical work will be made available to scholars for further researches

The former Principal of the Osmania University, Hyderabad-Deccan, Janab Mohd Abdur Rahman Khan, gives us a short introduction to THE MINOR TRACTS OF ABU RAIHAN MUHAMMAD BIN AHMAD AL BERUNI Some of these tracts, of Al-Biruni himself or of his disciples, were published by the Dairat al-Ma'arif of Hyderabad A fuller description of the contents of these tracts may be obtained from an article by the author published in the Hyderabad quarterly *Islamic Culture*, Fascicle IV, 1950 Besides the list of tracts the writer gives an interesting conspectus of Al-Biruni's scientific achievements

In AL-BIRUNI'S DETERMINATION OF GEOGRAPHICAL LONGITUDE BY MEASURING THE DISTANCES Prof J H Kramers of Leiden University studies the 2nd chapter of the VIth treatise of the *Qānūn'al-Mas'ūdī* which was rendered into German by C Schoy in *Isis* (Vol V, 1923, pp 51–74) But Schoy's translation is defective from the linguistic point of view Prof Kramers, therefore gives us here a more correct English rendering from the original and makes some pertinent observations on the text The article gives a glimpse of the 'laborious kitchen work' Al-Biruni had to do or to have done in the elaboration of the remarkable results he attained

Dr F Krenkow of Cambridge wrote on BERUNI AND THE MS SULTAN FATIH NO 3386 The Doctor begins with reminding the reader of what should be the correct English spelling and pronunciation of Abu Raihan's *laqab*, viz Bērūnī with a long *E* pronounced like *ea* in 'bear', and not Bīrūnī with a long *I* He strengthens his argument with a quotation from the introduction of Al-Biruni's *Kitāb al-Saidana* where the Iranian savant complains of the difficulty of expressing in one language, in the case 'Arabic', the sounds of other languages and especially of the vowels We feel we should apologize to Dr Krenkow for not having in this book on Al-Biruni adopted the spelling he advocates We surely understand the strength of his argument, but then there is the force of habit and perhaps also a musical appeal in Al-Biruni' which is not so evident in 'Beruni' We presume that Dr Krenkow will forgive us a musical licence In the papers contributed we, of course, kept the spelling adopted by their respective authors

Dr Krenkow then gives us an important extract of the MS Sultan Fatih No 3386 The title of the manuscript which was composed at Ghazna is *Kitāb fī Tahdīd nahāyat al-Amākīn wa Tastīh nasāfāt al-Masākīn* It is in the hand of Al-Biruni himself The manuscript has not been published as yet, but it had been photographed by Prof Ritter for the State Library of Berlin Dr Krenkow had the use of those photographs The aim of the book is to enable scientists to ascertain the longitudes and latitudes of different places and thus determine the correct direction of the Qibla

In the passage selected Al-Biruni insists on the importance of geographical knowledge and he reveals himself a foremost geographer Some of the remarks he makes about the age of the Earth which might be millions of years, of lands which were formerly seas, etc. render a very modern sound Dr Krenkow gives in appendix to his article the original Arabic text of the passage translated

L'ARTE DELL'ESPORRE IN AL-BIRUNI by Professor Martino Mario Moreno of the University of Rome is a study of the

Tārīkh'al-Hind from the didactico-esthetic point of view Prof Moreno reveals an aspect of Al-Biruni which may easily be overlooked, he shows us the artist and the master, 'il Maestro', within the scientist and the doctor Al-Biruni was not merely erudite, he did not hide his vast knowledge under the thick veil of abstruse considerations, he longed to communicate his science to his fellow-men, he wanted to be understood and he possessed a wonderful gift of exposition, of communication 'l'arte dell'esporre' It was the fruit of a warm heart which readily vibrated in unison with the wonderful world his studies had revealed to him 'egli e un cuore pulsante oltre che un cervello ragionante' This natural sympathy with the beautiful, with the truth which he liked to share with others, made him discover as by instinct the way to overcome distrust and indifference, and to captivate the attention and interest of his readers 'Il nuovo mondo che i suoi studi gli hanno rivelato ha fatto vibrare in lui le corde dell'umana simpatia, lo ha animato d'una passione che brama di communicarse ad altri, e sa quindi trovare le vie più adatte per vincere la diffidenza e l'indifferanza ed accativarsi l'interesse'

The method which Al-Biruni patronized most is the one of comparison and he was keen on finding first some common ground to base his teaching of new things The Author gives, as example, the clever way in which he taught the Hindu conception of the divinity to his Muslim contemporaries

The Author also studies some quotations of the *Bhagavad Gita* and their rendering into a rythmical and rhyming Arabic The translation is not literal when checked on the present day text of the sacred song, it seems to be combined with a commentary But Al Biruni wanted above all to be understood Although not literal his translation is sufficiently faithful to the original for his purpose, elegant and clear

The paper ends with some remarks on the way Al-Biruni translated into Arabic Sanskrit technical terms

Monsieur Louis Massignon of Paris explains in his article on AL-BIRUNI ET LA VALEUR DE LA SCIENCE ARABE why the Iranian scholar of Khwārizm chose to write in Arabic rather than in Persian or in the dialect of his native place The power of abstraction of the Arabic language made of it an ideal international vehicle for scientific thought, it was the language that had helped civilization' to spread all over the Mediterranean world Al-Biruni wrote in the preface of his Book of Drugs 'It is in the Arabic tongue that the sciences have been transmitted by means of translations coming from all parts of the world, their (value) is enhanced by it and this has allowed them to insinuate themselves into the hearts of men, and the beauty of that tongue has flown together with those

sciences into our arteries and into our veins' If Al-Biruni was to express his thought in such a way as to be understood by others he could not have done so in his own mother-tongue, the dialect of Khwārizm 'où une science serait aussi étonnée de se voir éternisée qu'un chameau de se voir dans la rigole de la Ka'ba, ou une giraffe de se voir parmi des purs sang'

Some of Al-Biruni's works, especially the *Āthār al-Bāqiya* are considered as most important sources of information about the history and the liturgical customs of certain little known Christian sects of Central Asia Rev Giuseppe Messina, s j, of the Pontifical Biblical Institute, City of the Vatican, has utilized Al-Biruni's Chronicle to determine the beginnings of Christianity in the city of Merv AL-BIRUNI SUGLI INIZI DEL CRISTIANESIMO A MERV

Merv was in the VIth century a commercial and cultural centre of Central Asia and a forward post of Christian penetration in the country Now about the origin of Christianity at Merv one of the few sources of information so far available is Al-Biruni's 'Vestiges of the Past', the *Āthār al-Bāqiya* He mentions somewhere a date and a name which are a clue to identify the first apostle of the faith at Merv The passage runs thus 'On the 21st day (of the month of Haziran—June) is made the commemoration of the priest Barshabba who brought Christianity to Merv about 200 years after Christ'

Prof Messina analyzes in details this reference of the Muslim historian and confronts it with the data of the *Chronique de Séert* published in the *Patrologia Orientalis* (Vol V, pp 217 fll) under the title 'Histoire Nestorienne' The relevant passage about Saint Barshabba goes from page 253 to page 258 After a careful sifting of the documents available about that period the Author has to conclude that historical evidence labours in favour of Al-Biruni's affirmation 'le notizie che abbiamo delle condizioni in cui vivevano i Cristiani quel tempo nell'impero persiano e dello sviluppo dell'apostolato cristiano no solo non contrastano con l'affirmazione di Albiruni, ma depongono in suo favore

Al-Biruni was always on the look-out for opportunities of increasing his knowledge about the world around him He was fond of questioning travellers, merchants, and ambassadors about the countries which they knew and which he Al-Biruni, was unable to visit He carefully consigned to writing their reports after checking them as best he could But to judge of the value of the information he gives about far away countries, one should know whom he gathered his information from Professor V Minorsky of Cambridge has written enlightening notes ON SOME OF AL-BIRUNI'S INFORMANTS

Information about China and Mongolia must have reached the scholar through the ambassadors of the rulers of Qitay and Yughur who visited the court of Sultan Mahmud round about A H 418/A D 1027, shortly before the composition of the *Qānūn* (421/1030). In fact Al-Biruni himself acknowledged in his *Kitāb al-Djamāhir* that 'he had interrogated the ambassador from the Qitay-Khan'

Prof Minorsky was able also to trace the informant from whom Al-Biruni received his information about the Polar regions He discovered that the author of the *History of Bayhaq* mentions that in 415/1024 the padishah of the Bulghars had sent an embassy to the padishah of Khorasan with some offerings for the mosques of Sabzavar and Khosraugird Al-Biruni's *Tahdīd al-Amākīn* was written one year after this visit a striking coincidence

Dr Mohammad Mo'in, Professor of Persian Literature at the University of Tehran, gives us in his BA'Z-I FAWA'ID-I LUGHAWIY-I KITAB'AL-JAMAHIR-I BIRUNI a very thorough philological study of some terms used by Al-Biruni in his work on mineralogy and precious stones, the *Kitāb'al-Djamāhir fī ma'rifat'al-Djawāhir* It is interesting to note the pahlavi or avestic origin of several of these technical terms To give but one example *Āzor-shust* is the combination of an old pahlavi word *ātash*, fire, which passing through avestic became in course of time *āzor* in Persian *Shust* is from *shustan* and means to wash, to bathe The compound, then, conveys the meaning of bathing in fire and it is the name used for the Angel of fire, the salamander and a kind of stone The Author, of course, shows all the intermediaries through which the term passed before obtaining its final shape Other terms considered are *nabharadj* a baser coin, a bribe, *khud-i khuruh*, the crest of a cock, amaranth, *roznāmdjah*, a calendar *shustakāt*, a kind of cloth, *kadkhudāhiyah*, the master of the house, and so on

AL-BIRUNI by Maulana Abdus Salam Nadvi of the Dar'al-Musannifin, Azamgarh, is a comprehensive survey in Urdu of the life and achievements of the great Persian scholar The study is based mainly on the sources mentioned by Edward Sachau in the introduction to the *Āthār'al-Bāqiyah* They are among others *Mu'djam'al-Udabā* (Vol VI), *Akhbār'al-Hukmā, Tabaqāt'al-Atbā', Sawān'al-Hikmah*

The author gathered from these works whatever information he could about Sheikh Abu Raihan, and out of them made an excellent biographical notice of our hero

Apart from Syed Barani's master work on Al-Biruni, there was in Urdu but little literature about the great scientist who wrote so well of the land and the people of India Maulana A S Nadvi has rendered a great service to Urdu readers by giving in Urdu a well

thought-out, concise and reliable account of the life and work of Al-Biruni

AL-BIRUNI AS A THINKER by Mr Arthur Upham Pope of New York, the Author of the monumental 'Survey of Persian Art', is a glowing elegy of Al-Biruni's achievements in the various fields of knowledge The greatness of the scholar was the natural outcome of the thoroughness of his scientific researches and of his remarkable intellectual honesty Al-Biruni was empassioned for truth in which he saw the unifying principle of the universe He was no eclectic, however, and would stand no compromise with half truth just for the sake of popularity or to please A genuine and sincere Muslim, 'he believed that the Koran was in all essentials in perfect harmony with other religious codes' in so far as they all shared more or less in the unique Truth, but he would have been antagonistic to the vague sentimentalism and intellectual laziness that have produced our modern World Fellowship of Faiths Al-Biruni was an accomplished scholar, nay an accomplished man

The article of Professor Dr J C Tavadia of Santiniketan on AL-BIRUNI AND ORIENTALISTICS brings the volume to a happy close The Author shows how disinterested Al-Biruni was in his scientific pursuit 'He was not actuated by any personal motives, but solely by the desire of knowledge about peoples of various countries and religions different from his own, and that out of pure intellectual curiosity of finding the truth, be it pleasant or not' Yet far from him intellectual selfishness! He wanted his efforts to help in the advancement of culture and mutual understanding between peoples This is clear from the aim he set himself when writing the *Tārīkh'ul-Hind* In the conclusion of the book he gives himself this testimony 'We think now that what we have related in this book will be sufficient for any one who wants to converse with the Hindus, and to discuss with them questions of religion, science, or literature, on the very basis of their own civilization'

Prof Tavadia completes his paper with some suggestive remarks on some passages of the *Tārīkh* from which so many old Hindu customs can be gathered He suggests even that a commentary should be made on the facts about Indian antiquities recorded in that unique book, he shows some striking illustrations

We have added an INDEX to the volume It will be found wanting in many ways We did not, indeed, try to make it exhaustive, but suggestive only of the main topics touched in the book

V Courtois, S J,
President, Iran Society

M Ishaque,
Honorary Secretary, Iran Society

MUSLIM RESEARCHES IN GEODESY

By

SYED HASAN BARANI, B A , LL B ,
Advocate, Bulandshahr

و انما فعلت ما هو واجب على كلّ انسان، ان يعمله في صناعة من تقبّل

اجتهاد من تقدمه بالمنة، و تصحيح خلل ان عثر عليه بلا حشمة، ......

و تخليد ما يلوح له فيها تذكرة لمن تأخر عنه بالزمان، و أتى بعده، *

(البيروني في القانون المسعودي)

"And I have truly done what every one is bound to do in respect of any particular science, that is, to accept gratefully the original contributions of his predecessors, to correct fearlessly the errors that come to his notice and to preserve what he himself discovers and to leave it as a record for the future generations that are to follow him in time "

(Al-Birûni, in his *Canon Masûdicus*)

[*This Study is dedicated with his kind permission to Dr George Sarton, S D , the illustrious author of "Introduction to the History of Science," and the founder and editor of "Isis," the International Review devoted to the history of Science and Civilization*]

The history of sciences, like that of all other human achievements, is the story of an endless adventure Some of the best minds of various nations and countries, in different ages, have contributed to its total progress in various proportions The part played by the Muslims in the course of their long history still awaits a just and proper recognition They are generally assigned the modest rôle of being the mere transmitters of the ancient lore of the West and the East [1] Their true share in the scientific development

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[1] For instance, the latest expression of this erroneous view will be found in the well-known thinker and writer Bertrand Russel's History of Western Philosophy, (1946) an excellent work on the whole, where in chapter X on Mohammadan Culture and Philosophy he remarks that 'Mohammedan civilization in its great days

is, however, really much greater than that of an intermediary The credit of preserving different ancient sciences and transmitting them intact to the modern times would, by itself, be no small matter, but in truth the Muslims in many instances improved the old sciences, achieving better or more positive results than those of their predecessors, and in others broke fresh grounds, discovering new ideas, and sometimes even creating new sciences where there had existed none before It is the business of the impartial historian to make a correct estimation of their labours and achievements

All the sciences we know have advanced to the present state bit by bit and step by step, though often by tortuous paths, and not without many set-backs Their total progress, however, is an established fact Every step taken forward has its own significance, as it leaves behind the legacy of positive gains, which, when properly garnered, make their own contribution to the general stock Our modern knowledge would as much count a background stage in the eyes of the future generations, when they would have advanced much beyond our present acquisitions, but not without receiving from us a handsome legacy of net gains Similarly we all owe great debt to the past, and the only manner in which we can repay it is by recognizing the real significance of the previous labours, and expressing our sense of gratitude to the great masters of the former generations

These preliminary observations of an abstract nature have a direct bearing on our present study, which deals with the labours of the Muslim astronomers in the field of Geodesy, a science which treats of the shape, size and curvature of the Earth It is a branch of Astronomy as well as of Physical Geography, the two sciences in which the Muslims took a keen interest, and have left some notable results In Geodesy itself they made splendid researches, which, although described now and then by several scholars, still await fuller and more correct treatment

Among the Orientalists we owe their best treatment to that Great Italian Scholar C A Nallino, the editor and translator of Al-Battâni,[1] and the author of the most valuable lectures delivered in 1909 and 1910 in the Egyptian university on the history of the Arabian Astronomy

''علم الفلك تاريخه عند العرب في قرون الوسطى''

An entirely independent, and in some respects detailed, treatment of the same subject was attempted by the present writer in

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was admirable in the arts and in many technical ways, but it showed no capacity, for independent speculation in theoretical matters ' 'Its importance, which must not be underrated', says Russel, 'is as a transmitter', p 448.

[1] *Kitâb-ul-Zij-ul-Sâbi* (Al-Battani), Rome, 1889.

the second edition of his 'Life of Al-Bîrûnî', published in 1927 by the Anjuman-e-Taraqqi-e-Urdu (pp 188–203), substantially based on some previous articles of his own, published in different Indian Journals

I am now led to take up the whole subject afresh, as besides some important new materials that have recently come to hand, I have re-examined, checked, and thrashed out all the data, and improved upon, and, at times, even corrected, my own previous studies and researches

The present study, therefore, although utilizing my own former studies, as well as the most excellent studies of C A Nallino, are substantially new, both in their content and treatment I have tried to make it as complete and exhaustive as possible, and have, therefore, quoted in extenso the original texts, whether drawn from the unpublished manuscripts or the printed books

We find that although some further researches in Geodesy were attempted by some subsequent Muslim astronomers,[1] the highest mark had already been achieved by the most illustrious astronomers of Al-Mâmûn, and by that greatest astronomer and mathematician of all the Muslims, Al-Bîrûnî, whose scientific researches are always of the first order, and deserve our special concern, being so often closely associated with our own country—the scene of his most important researches in Geodesy as well as of those other vast and arduous labours in the entire field of languages, literature, sciences, and culture of the ancient Hindû nation, of which he has left such a precious account in his monumental work on India, known as the 'INDICA' of Al-Bîrûnî

Geodesy in modern times occupies the position of a distinct science, having its own band of specialists as well as a number of societies exclusively devoted to it Before the war it also claimed a world-wide International Organization [2]

For at least about 2,500 years, if not for more, the scientists have known the fact that the earth is round and a globe in its form. It was known full well to the astronomers of ancient Greece and India, and all the subsequent scientists of the world have learnt the idea from them The Muslim astronomers, who at first derived their knowledge from both these original sources, readily accepted it and tried to support it by adducing better and newer proofs. But by the Greek, Hindû and Muslim astronomers the Earth was always considered to be a perfect globe It was reserved for the modern astronomers, Newton and others that followed him, to

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[1] Ullugh Beg, e g, sent Qûshji to China to measure an arc of the meridian I have described their results in my *Al-Berûnî* (2nd edition)

[2] See the article on 'Geodesy' in the Encyclopedia Britannica

discover and establish that the Earth is not so much a perfect globe as an oblate spheroid of its own peculiar form—a 'geoid', with depressions at the two ends near the poles and a little bulging at the Equator

As soon as it was known that the Earth is a globe the astronomers set about the task of finding out its actual dimensions We have the results of such measurements by several astronomers in Ancient Greece and India Judging by what we know of the methods employed and the actual results achieved by them, we have reasons to believe that their results were probably more or less of a tentative nature, and never very precise nor accurate

The honour of obtaining the first approximately accurate measurements was reserved to the Muslims, whose astronomers employed distinct methods, in the first instance by (*a*) directly measuring and ascertaining the precise value of an arc of the meridian and in the second instance, by (*b*) finding out by the most recondite trigonometrical processes the entire length of the Earth's radius, and thereby of the diameter and the circumference, and eventually working out the whole area and volume of the Earth s globe

The former was the method adopted by the astronomers of Al-Mâmûn in the early third century A H (early half of the ninth century A D) and the latter that of Al-Bîrûni in the early fifth century A H (early eleventh century A D)

Geodesy has certainly made great strides in the modern times, but as already indicated, its history goes back to remote times. The ancients also used the Earth's radius as a unit for their celestial measurements

Amongst the Greeks Dicaerchos (320 B C), Eratosthenes (295 B C) and Hipparchus (160 B C) attempted the measurement of the Earth in different manners We know on Aristotle's authority that the old astronomers had calculated the circuit of the meridian to consist of 400,000 stadia Eratosthenes found 250,000 stadia and Posedonius (57 B C) 240,000 stadia Ptolemy (151 A D), the most famous Alexandrian astronomer, found a degree to consist of 500 stadia and the circumference 180,000 stadia [1]

Among the Hindûs, who also occupied themselves with the subject, Aryyâbhâtta (B C), the best known of their astronomers, found the Earth's diameter 1,050 yojanas and the circumference as 3,364 yojanas The writer of Siddhânta gives the diameter as 1,600 yojanas, Brahma Gupta (fifth or sixth century, A D) gives the circumference as 5,000 yojanas and at another place as 4,800 yojanas and the diameter 1,581 yojanas Bhashkar Âchârya, the last great astronomer of the Hindûs, apparently resting on Brahma Gupta,

[1] For the Greek researches in detail see Nallino's Lectures

gives the diameter as $1{,}581\frac{1}{24}$ yojanas and the circumference as 4,967 yojanas [1]

The length of the Greek stadia and the Indian yojanas, varying from time to time and place to place, we have no certain and agreed data to test and verify their various results with any amount of absolute precision We have, however, attempted in another place (Al-Birûni, pp 199–201) to make a comparative study of them, but we must confess that in the present state of our knowledge it is not possible to claim exactitude for those results All that we can say at present is that they are of a mere tentative nature, some of them perhaps approximating the correct value more closely than the others

So far as we could judge, most probably amongst the Hindûs the best result was obtained by Aryyâbhâtta, and amongst the Greeks by Posedonius, though both of them seem yet very far from correct estimations

Amongst the Muslims the real interest in astronomical studies began in the middle of the second century after the establishment of the Abbâsid Caliphate and reached its zenith in the golden age of Al-Mâmûn the Great (A H 198–218/A D 813–833) who was a true patron of all the sciences of his times The Muslims of that early period derived their entire knowledge of Astronomy first from the Hindûs and then from the Persian and Greek sources

Having readily and whole-heartedly accepted the theory of the Earth's rotundity, and noticing that the ancient accounts of the Earth's measurements so widely differed, and were not verifiable on account of their ignorance of the true lengths of the various standards of measurements employed by those ancients, the Muslim astronomers set about in earnest to find out for themselves and in their own way the true dimensions of the Earth

It was by Al Mâmûn's own order that his illustrious astronomers, for the first time in the world's history, resorted to a strictly scientific and well directed measurement of an arc of the meridian, and by means of it to further ascertain its circumference as well as its diameter They were truly the greatest astronomers of their age, and judged by their results, proved themselves also to be the perfect masters of their craft

Most probably they had made a detailed record of their operations But unfortunately those original records, and even

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[1] See Premchanda's Hindû Astronomy, 1896 pp 120, 198, 193, and Al-Birûni's *Kitâb-ul-Hind*, Arabic text, pp 160 and 161, and English translations, Vol I, pp 312-313

contemporary accounts relating to them, are nearly all lost[1], probably beyond any hope of recovery We have, therefore, almost wholly to depend for our information on the subsequent writers, some of whom apparently had access to them, and have left fairly reliable accounts And we have a number of such accounts Only a few of them can be treated as independent ones, as being of primary importance Most of the others are more or less of a secondary nature, derived as they are from some other intermediary sources At first sight there appears to be some conflict of details even in our best available authorities, and before we could satisfactorily account for these divergences, and attempt to actually reconcile them, or come to our final conclusions, we have to make a thorough study of all the available materials, and then ascertain their respective merits

Almost the first in point of time[2] is the account given in

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[1] The only exception is Habash, whose one work has survived, viz *Opus Astronomicum* (zij) in the Imperial Library of Berlin (p LXVI of Part I of Nallino's translation of Al-Battâni)

[2] Strictly speaking the first in order would be the reference in the medical work *Firdaus-ul-Hikmat* (Berlin, 1928) (فردوس الحكمة) by Abul-Hasan Ali bin Sahl Rabbân ul-Tabari (ابو الحسن علي بن سهل ربان الطبري) (middle of ninth century A D) where at page 547 in the chapter dealing with the rotundity of the celestial sphere and the Earth's globe he gives account of the Earth's dimensions in the following manner —

قال بطلميوس وغيره من الفلاسفة ان الارض والماء وسائر الطبائع مستديرة كرية، وان استدارة الارض كلها وجبالها وبحارها اربعة وعشرون الف ميل وان قطرها وعمقها وعرضها سبعة الآف وستة وثلاثين ميلاً.

وانهم انما استدركوا علم ذلك بانهم اخذوا ارتفاع القطب الشمالي في مدينتين هما على خط واحد من خط الاستواء، مثل مدينة تدمر والرقة، فوجدوا ارتفاع القطب في مدينة تدمر اربعة وثلثين جزء، وفي مدينة الرقة خمسة و وثلاثين جزء وثلث جزء، بينهما زيادة جزء وثلث.

ثم مسحوا ما بين الرقة وتدمر، فوجدوا سبعة وستين ميلاً، فعلموا ان لكل جزء وثلث جزء من اجزاء الفلك الاعظم.

"Ptolemy and other philosophers say that the Earth, the sea and the natural elements are round and global in form, and the circumference of the whole Earth, including its seas and mountains, is 24,000 miles, and its diameter, or depth, or width 7,036 miles They ascertained it by taking the altitude of the Polar Star in two places which happened to be on the same line from the Equator, e g Tadmur (Palmyra) and Al-Raqqâ They found the altitude of the former 34° and that of Al-Ruqqâ $35\frac{1}{3}°$, so the difference between these being $1\frac{1}{3}°$ Then they measured between Al-Raqqa and Tadmur and found the same to be 67 miles. Thus they found out the length for $1\frac{1}{3}$ degree of the great sky line "

This passage of Tabari has been quoted nearly verbatim by Al-Masûdi in his 'Meadows of Gold' with very slight variants from the text as quoted in the above (See volume 1, pp 75, Bagdâd edition)

Al-Masûdi's (†346 A H = 958/959 A D) 'Meadows of Gold' (Murûj-ud-dhahab مروج الذهب) wherein he says as follows —

ذكر حبش المنجم صاحب كتاب الزيج فى النجوم عن خالد بن عبد الله المروزى وغيره، و قد كانوا رصد و الشمس لأمير المؤمنين المأمون فى برية سنجار من بلاد ديار ربيعة ان مقدار درجة واحدة من وجه الارض ستة و خمسون ميلاً، فضربوا مقدار درجة واحدة فى ثلثمائة وستين، فوجدوا دور بسيطة كرة الارض المحيطة بالبر و البحر عشرين الف ميل و مائة و ستين ميل، ثم ضربوا دور الارض فى سبعة، فاجتمع مائة الف ميل واحد و اربعون الف ميل، و مائة و عشرون ميلاً، فقسموا ذلك على اثنين و عشرين، و خرج القسم الذى هو مقدار قطر الارض ستة آلاف و اربعمائة و اربعة عشر ميلاً و نصف عشر بالتقريب، و نصف قطر الارض ثلثة آلاف ميل و مائتا ميل و سبعة اميال و ست عشرة دقيقة و ثلثا ثانية، يكون ربع ميل و ربع عشر ميل، و الميل اربع آلاف ذراع بالاسود، و هى الذراع التى وضعها امير المؤمنين المأمون للثياب و مساحة البناء، و قسمة المنازل، و الذراع مائة عشرون اصبعاً *

"The astronomer Habash, the author of *Kitâb-ul Zij* in Astronomy reports from Khâlid-bin Abdullâh of Merv and others, who had made observations on the Sun for Amir-ul-Momenin Al-Mâmûn in the desert of Sinjâr, one of the towns of Diyâr-e-Rabia, that the length of a single degree of the Earth's surface is 56 miles They multiplied this single degree of the Earth's surface into 360, and found the circumference girdling the Earth including the seas, and the land to consist of 20,160 miles By further multiplying the

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The author though one of the great physicians of Islâm is apparently not much versed in the astronomical and mathematical sciences The above account is not free from confusion and inaccuracy Evidently it echoes some popular traditions of his times regarding the generally known measurements of Al-Mâmûn's times carried out by the astronomers between Tadmur (Palmyra) and Raqqâ It certainly gives a manifestly inaccurate figure for the length of the arc, unless there be some errors of the copyists like سبعه و سبعين (77) for سبعه و ستين (67) for the former would nearly, though considerably in excess, correspond with the length of the 1½ arc as found by a party of Al-Mâmûn's astronomers

We leave the matter as it is without further comment, as it will become clear as we proceed further in this study

Earth's circumference into seven they found the result 141,120 miles They divided it by 22, and got the quotient representing the Earth's diameter as about 6,414½, and the radius 3,207 miles, 16′ and ⅔″ which would amount to $\frac{1}{4}+\frac{1}{40}$ of a mile The mile contains 4,000 cubits of Al-Aswad—a measuring stick invented by Amir-ul Momenin Al-Mâmûn for measuring cloths and buildings and also for fixing stages on the routes, and the cubit consists of 120 fingers "[1]

Al-Masûdi again reverts to the subject in his later work *Al-Kitâb-ul-Tanbih wal Ishrâf* كتاب التنبيه و الاشراف where he says —

و فيما ذكرناه من مقدار حصة الدرجة من الاميال تنازع، فمنهم من رأى ان ذلك

سبعة و ثمانون ميلا، و منهم من رأى ذلك ستة و خمسون ميلا و ثلثي ميل *

و المعول في ذلك على ما حكيناه عن بطلميوس - (ص ٢٦-٢٧) *

"There is dispute (amongst the scholars) regarding what we have said about the length of a degree as expressed in miles Some say it is 87 miles, others that it is 56⅔ miles People generally rely in this matter on what we have reported from Ptolemy" (who gives 66⅔ miles)

Next comes the account given by the great Muslim astronomer of Egypt Ibn-i-Yûnus (A H 399/A D 1000) in his *Kitâb-ul Zij-ul-Kabir* dedicated to the Fâtimid Caliph Al-Hakam, and is quoted here from the unique manuscript (Or 143, No 1057 of the third volume of the printed catalogue of the Leyden Library), as extracted by Nallino (p 218 of the Lectures) The French translation is found on pp 95-96 of the Extracts from the manuscripts in the *Bibliothèque Nationale* of Paris, Volume VII, 180, 'Le Livre de la Grande Table Hakemite'.

"الكلام في ما بين الاماكن من الدرج"

ذكر سند بن علي في كلام وجدته له ان المامون امره هو و خالد بن عبد الملك

المروروذي ان يقيسا مقدار درجة من اعظم دائرة من دوائر سطح كرة الارض، قال فسرنا

لذلك جميعا - و امر علي بن عيسى الاسطرلابي و علي بن البحتري بمثل ذلك، فسارا الى

ناحية اخرى *

[1] Volume I, pp 118, 119 on the margin of Ibn-ul Athir's History (Cairo) and p. 72 of the Baghdad edition

قال سند بن علی، فسرتُ انا و خالد بن عبد الملك الی ما بین وامه(الرقّه) و تدمر، و قسنا هُنالكَ مقدار درجة من اعظم دائره تمرّ بسَطح الارض، فكان سَبعه و خمسين ميلا وقاسَ علی بن عیسی، و علی بن البُحتری، فوجدا مثل ذلك، و وَرَدا الكتابان من الناحيتين فی ذلك فی وقت واحد بقياستين متفقين *

و ذكر احمد بن عبد الله المعروف بحَبَش فی الكتاب الذی ذكر فيه ارصاد المُمتَحن بدمشق انّ المامون امر بان يقاس درجة من اعظم دايره من دواير بسط كُرَة الارض، قال فساروا لذلك فی بَرِّية سنجار حتی اختلف ارتفاع النّهار بين القياسين فی يوم واحد بدرجة، ثُم قاسوا ما بين المكانين، فكان ستّ و ميلاً و ربع ميل، و (كُلّ ميل) منها اَربعة آلاف ذراع بالذراع السّوداء التی اتّخذها المامون *

و اقولُ انا و بالله التوفيق، ان هذ القياس ليس بمطلق، بل يحتاج مع اختلاف ارتفاعی نصف النهار بدرجه الی ان يكون القائسون جميعاً فی سطح دايره واحده من دوائر نصف النهار، و السّبيل الی ذلك بعد ان يختار للقياس مكان معتدلاً صاحياً، ان يستخرج خط نصف النهار فی المكان الّذی يبتدی منه القياس، ثم تتّخذ حبلين دقيقين جيّدين، طولُ كل واحد منها نحو خمسين ذراعاً، ثم نُمرّ احدهما موازيا بالخط نصف النهار الذی استخرجناه الی ان ينتهی ثم نَضع طرف الحبل الآخر فی وسطه، و نمرّه راكبا عليه، الی حيث بلغ، ثم نرفع الحبل الاوّل، و نضع ايضاً طرفه فی وسط الحبل الثانی و نمرّه راكباً عليه ثُمّ نفعل دائما ليحفظ السمت و ارتفاع نصف النهار يتغيّر دائماً بين المكان الاوّل الذی استخرج فيه خط نصف النهار و المكان الثانی الّذی انتهی اليه الّذين يسيرون، حتی اذا كان بين ارتفاعی نصف النهار فی يوم واحد درجه بآلتين صحيحتين بين الدقيقه فی كُلّ واحده منها قيس ما بين المكانين، فما كان من الاذرع فهو درجه واحد من اوسع دائره تمرّ بسيط كره الارض *

و قد يمكن ان يحفظ السمت عوضاً من الحبلين باشخاص ثلاثة تسير بعضها بعض
علي سمت خط نصف النهار المستخرج و ينقل اقربها من البصر متقدماً، ثم الذى عليه،
ثم الثالث دايماً، انشاء الله تعالى *

"An account of distances between places in cubits' Sind bin Ali has himself stated in a report that I have myself seen that Al-Mâmûn ordered him and Khâlid bin Abdul Malik-ul-Mâwarudi to calculate an arc of the meridian on the surface of the Earth's globe He says, 'We both went together for this purpose' He similarly ordered Ali bin 'Isâ—the designer of the astrolabes, and Ali bin Albukhtari They went to another part of the country

Sind bin Ali says, 'I and Khâlid bin Abdul Malik went to Wama (obviously misreading of the copyist for Raqqa) and Tadmur (Palmyra) and calculated a degree of the arc of the meridian round the surface of the Earth's face as 57 miles Both Ali bin Isâ and Ali bin Al-Bukhtari also found similarly'

The written accounts of both these expeditions reached at the same time with both the calculations agreeing Ahmad-bin Abdullâh known as Habash says in his book in which he has described the astronomical observations which were made at Damascus by way of verification (of the previous observations) that Al-Mâmûn ordered the calculations of an arc of meridian, i e, one of the circles on the Earth

Habash says, 'They went for this purpose to the plains of Sinjâr till the meridian varied in the two calculations made on the same day to the extent of a single degree'

They then measured the actual distance between the two places and found it to be 56¼ miles Every mile consisted of 4,000 cubits of Al-Saudâ, a scale which Al-Mâmûn had prescribed

I (Ibn-i-Yûnus) say, relying on God's help, that the calculation is not always of an absolute nature It further needs that along with the difference of the two altitudes of the meridian to the extent of one degree, the calculations be carried on the same surface touched by the same circles of the meridian And they should resort to it after selecting for their operations a plot of land which is even as well as bright They should then begin to find out the actual meridian of the place where they begin their calculations

We should take two thin but strong ropes, each one of them of about 50 cubits Then we should draw one of them on the line of the meridian which has already been found out, till we come to the end of the rope There we should lay down the end of the other rope in the middle of the first rope and carry it further to its full length, as if riding on it till we reach the other end There we raise the first rope and throw its one end in the middle of the second rope, and

continue riding on it We continue repeating the process to keep the direction (straight)

The altitude of the meridian would always vary between the first place where we found it in the beginning and the place where arrive the people who have done the walking, till they reach the point, where there is between the two altitudes of the Meridian in the same day one degree's difference by reliable instruments Then is disclosed the value of every one arc of that meridian calculated between the two places Whatever is the number of the cubits that is the measure of the arc of the great circumference of the surface of the Earth's globe [1]

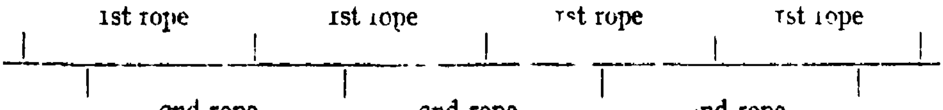
It is also possible to preserve the course by employing, instead of two ropes, three persons who keep on following one another on the track of the meridian line that has been ascertained and the nearest from sight walking at the head, then the other immediately next to him, and then the third Thus continually "[2]

The next account of these researches of Al-Mâmûn's times is found in Al-Birûni's works, of which we know at least four separate versions, which we shall take up in their chronological order

First of these is found in his '*Tahdid Nihâyât il-Amâkin li Tashih Musâfat il-Amâkin,*' تحديد نهايات الاماكن لتصحيح مسافات الاماكن (416 A H, 1025-1026 A D), the unique autograph copy of which exists in Fâtih's mosque in Istambul (Nr 3386) and from which some extracts have recently been published in 'Beruni's Picture of the world' by Zaki Validi Tojan [3] It is as follows —

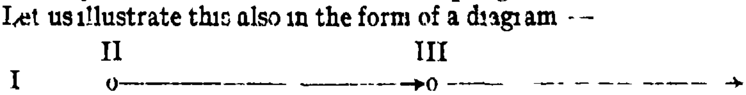
و انما رصد المامون، كان لما طالع من كُتُب اليونانيين حصّة الجزو الواحد خمس مائة اسطاذيا، و هو مقدار لهم، كانوا يقدرون بها المسافات، و لم يجد عند

[1] This process for keeping straight may be illustrated by means of a diagram like this —



You have only to take care that both these ropes go on the same line

[2] Let us illustrate this also in the form of a diagram —



The second moves to the third, the first moves to the second, the third advances to the next position which is again taken by the second followed by the third and so on

[3] No 53, Memoirs, Archaeological Survey of India

صفة المعمورة على البيروني
(ملتقطات من القانون وغيره)

المترجمين علماً شافياً بمقداره مما يتعارف عليه حينئذ، أمر على ما حكى حبس عن خالد المروروذى جماعة من علماء الصناعة و حذاق الصناع من النجارين و الصفارين بعمل الآلات، و اختيار موضع لهذه المساحة، فاختير موضع من برية سنجار من حدود الموصل، يبعد عن قصبتها تسعة عشر فرسخا، و من سر من رأى ثلثة و اربعين فرسخاً، فأرضوا استواها، و حملوا آلات اليها، و عينوا منها موضعاً رصدوا بها ارتفاع الشمس نصف النهار، ثم افترقوا منه فريقين، فتوجه خالد مع طايفة من المساح و الصناع الى جهة القطب الشمالى، و توجه على بن عيسى الاصطرلابى و احمد بن البحترى الذراع مع جماعة نحو القطب الجنوبى، و رصدت كل طايفة منها ارتفاع الشمس نصف النهار، حتى وجدوه قد تغير جزءاً واحداً، سوى التغير الحادث من الميل، و كانوا يذرعون الطريق فى ذهابهم و ينصبون السهام على طريقهم، فلما عادوا اعتبروا المساحة ثانية، و اجتمعت الطائفتان حيث افترقتا، فوجدوا حصة الجزء الواحد من الارض ستة و خمسين ميلاً، و زعم انه سمع خالداً يملى ذلك على يحيى بن اكثم القاضى، فالتقطه منه سماعا، و هكذا حكاه ابو حامد الصغانى عن ثابت بن قرة، و حكى عن الفرغانى تلقا مثل ستة الاميال المذكوره *

و كذلك وجدت الحكايات كلها مطبقة على هذين القدرين، و لا يجوز ان احمل ذلك على سقوطه من نسخة كتاب الابعاد و الاجرام، لأن حبس استخرج من ذلك دور الارض، و قطرها، و ساير الابعاد، و اذا امتحنت وجدت حاصله بمن الستة و الخمسين ميلاً للجزء الحاصل، بل اولى من ذلك ان يظن بالروايتين صدر عن الفريقين، و هو موضع تحير، باعث على تجديد الامتحان و الرصد، و من لى به، و هو محتاج الى اقتدار بسبب الانبساط فى المكان و الاحتراس من غوايل المتسرسر فيه - و كنت اخترت له البقاع التى بين دهستان المصاقب لجرجان، و بين ديار الاتراك الغزيه، فلم يساعد المقادير، ثم الهمم المسترفده على ذلك - (ص ٦٥-٦٦) *

"As to Al-Mâmûn's observations (رصد المامون) it was due to the fact that when he read in the Greek authors that one arc in the meridian measured 500 stadia, which was the standard used by the Greeks for the measurement of distances, and the actual length of this scale was not known satisfactorily to the translators (in Arabic) so as to enable them to identify it with any standard of measurement known to them, Al-Mâmûn, according to the account given by Habash from Khâlid-al-Marvarudi ordered a party of the learned astronomers, and expert artisans amongst the carpenters and workers in brass to prepare instruments and select a spot for their survey They chose a spot from the plain of Sinjâr in the neighbourhood of Mausil (Mosul), 19 farsakhs (فراسخ) from the town itself, and 43 farsakhs from Surraman-ra'â (Samarrâ) They liked the spot on account of its levelness, and carried the instruments there They specified a particular site for the observation of the Sun's altitude at the meridian Then departed from that point two groups—Khâlid, with one party of the surveyors and artisans, heading towards the Northern Pole, and Ali bin Isâ-ul-Ustuilâbi, (the maker of the astrolabes) and Ahmad bin Al-Bukhtari-ul Zarra, the surveyor with the cubit, with another party, left to the South Pole Both the parties observed the Sun at the Meridian till they found it declining to one degree without making any alterations in their straight course While thus proceeding they marked their paths with the measuring sticks and fixing arrows at the points When they returned they once more verified their survey for the second time, till, both the parties came together at the place whence both had started

They found the single arc of the Earth as fifty-six (56) miles

Habash believes that he heard Khâlid dictating this to Qâzi Yahyâ bin Akthami So he got this information from Khâlid

Abu Hâmid Al-Sâghâni has also narrated similarly from Thâbit bin Qurrâ, but from Farghâni is reported ⅔ more in addition (to 56 miles) I have found all the other accounts agreeing about this ⅔

I cannot ascribe (this omission) to an over-sight in the manuscript of *Kitâb ul-Ab'ad-wal Ajrâm* by Habash (dealing with the magnitudes of the stars and their distances from the Earth), as Habash has also calculated on the basis of this figure the circumference and the diameter of the Earth as well as all the other distances

When I examined those other calculations myself I also found this result based on 56 miles

It would, therefore, be better to ascribe this divergence arising out of the two distinct results obtained by both the parties (working independently)

This, however, should be a matter for one's amazement and necessitates fresh examination and observations

Who is prepared to help me in this (great adventure) which needs command over a vast tract of land and proper control over the parties dispersed in it (in the course of such an expedition)?

I used to choose for this purpose localities situated between Dihistân in the vicinity of Jurjân and the land of the Ghuzz Turks. As the values (obtained by me in the course of such expeditions) would not agree, the courage of those who had financed the projects gave way." (pp. 65-66)

The second account is found in Al-Birûni's *Kitâb-ul-Tafhim-Li-Sunâ'at-ul-Tanjeem* (كتاب التفهيم لصناعة التنجيم) written by the author himself in Arabic and Persian languages separately. I quote the following from the Persian text recently published in Iran —

پس اندازهٔ زمین چند است؟

امّا دانستن اندازهای ستارگان را آن پس بود که زمین را یا قُطرش را یکی نهیم، همچنان که یکی را اندر پیمودن سنگ یا ارش یا کیل، باصطلاح بایکدیگر نهند *

و لیکن اگر کسی آنرا بدان مسافتها خواهد که میان مردمان مستعمل و معروف است باید دانستن که قطرِ زمین دو هزار و صد و شصت و سه فرسنگ است، و چهار دانگ فرسنگ و دورش گرد بر گرد شش هزار و هشت صد و سنگ است ـ و بر این شمار مساحتِ روی او از بیرون چنانکه ارشی اندر ارشی یک ارش مکسّر باشد، چهارده بار هزار هزار و هفصد و دوازده هزار و هفتصد و بیست و هفت فرسنگ و چهار یک، و مساحتِ تن او جمله چنانکه ارشی اندر ارشی یک ارش مکسّر باشد چون مکعّب، صد و شصت و شش هزار و هفتصد و چهل و چار هزار و دویست و چهل و دو فرسنگ، و دو پنج یک از فرسنگ *

و چُون چنین بوده آنگاه بُعد کوکب گیری و بفرسنگهای نیمه قطر زمین زنی و قطر کوکب بفرسنگهای قُطر زمین، و تن کوکب بمساحت تن زمین *

هیچ خلاف هست اندر مقدار زمین؟

ازین چاره نیست، که ازان چیزهاست که مرجع اُو بآزمودن است از دوری و سپس آن بچیزهای زمین *

و هر گروهی او را بدان مَسافتها دانستند که ناحیتِ ایشان نکار داشتند، چون
اسطادابیوس یونانیان را، و جوزن گروه هندوانرا *

وزین جهت چون کتابها تازی همی گردانیدند، و آن اندازها تحقیق دانسته نیامد،
مامون خلیفه پسر هُرون الرشید فرموده است تا اندازهٔ زمین، از سر آزموده آید *

و گروهی را از دانایان چون خالدِ مَرورودی و بو البُحتری مسّاح و علی بن عیسیٰ
اُسطرلابی و گروهی مانند ایشان بفرستاده است سوی دشتِ سنجار با طریق آن نکار داشتند
و حصّهٔ یکی درجه یافتند از دائرهٔ بزرگ تَر زمین، و پنجاه و شش میل و چهار دانگ میل،
و آنرا سی صد و شصت زدند میلهای دور زمین گرد آمد ـ بیست هزار و چهار صد
و هر میلی سه یک فرسنگی بود، و میل چهار هزار آرش سوداست، و سودا ارشی است
بعراق معروف، و ساها بدو بنامند اندر بغداد، و بست و چهار انگشت است، و من
نیز بزمین هندوستان آنرا بدیگر طریقها آزمودم، بسی خلاف نیافتم با این مقدار که
حکایت کردیم (ص ۱۵۶-۱۶۴) *

'Q What are the dimensions of the Earth?

A For the purposes of ascertaining the magnitudes and distances of the stars it is sufficient to take the Earth or its diameter as a single unit, just as by measuring by means of a stone, or cubit or cup, we take a particular standard as an agreed unit

If any one wants to know them by such distances as are well known and in vogue amongst the people let him know that the Earth's diameter is $2{,}163\frac{7}{11}$ farsangs and its circumference 6,800 farsangs and according to those calculations the total area of the Earth's surface from outside in the manner in which you multiply one cubit into one cubit i e, square cubit, is $14{,}712{,}727\frac{1}{4}$ farsangs and the total area of its whole body (as a globe) in the manner of multiplying one cubit into one cubit square, i e, cubic cubit, is $166{,}744{,}242\frac{2}{3}$

And when it is so, take the distance of the stars and multiply it with $\frac{1}{2}$ of the Earth's diameter (i e, its radius) and their equators with the Earth's equator and the star bodies with the (volume of) the Earth's globe

Q Is there any difference of calculations in respect of these dimensions of the Earth (as given above)?

A Yes, that is inevitable as it is one of those matters which entirely depend on ascertaining first the circumference and then other earthly articles

And every nation (of the World) have known it by means of such standards of length as were in use in their respective countries For instance 'Stadia' amongst the Greeks and 'Yojanas' amongst the Hindus

So when books (on Astronomy) were being translated into Arabic and those measurements were not exactly verifiable, the Caliph Mâmûn, son of Hârûn Al-Rashid, ordered that the Earth's dimensions be ascertained *de novo* He sent a number of the scientists of his time like Khâlid Marvârudi, Bu Bukhtari, the surveyor, Ali bin Isâ, the maker of astrolabes, and many others like them, to the plains of Sinjâr They eventually carried out the project and found the length of a degree of the largest circle as 56⅔ miles

They multiplied it by 360, so that the miles for the Earth's circumference amounted to 20,400 Every farsang consisted of 3 miles and a mile 4,000 Sauda cubits, and Sauda is the well-known measuring stick of Mesopotamia, and with it people measure places in Baghdâd It consists of 24 fingers I also verified its accuracy in other ways in the land of India, and did not find it much different from the value mentioned by me in the above (pp 156–164) ''

Al-Birûni reverts to the subject in detail in his *opus magnum Al-Qânûn-ul-Masûdi* (Canon Masudicus) From his own statement in an epistle written to a friend about the works of Al-Râzi (Rhazes), the physician, and in which he has also given a detailed account of his own works compiled up to the year 427 A H (1035-1036 A D [1]) we find that Al-Qânûn was not yet completed by the author The subject of the Earth's dimensions had, however, attracted his special interest He had already written a small book of some 180 pages on the subject, and the same is mentioned in his list

(مقاله ى استحراج قدر الارض برصد انحطاط الاوى من قلل الجبال)[2]

We are not, however, in a position to judge, it at the time when he wrote 'Al-Qânûn' he had succeeded in obtaining better information on the subject than what he had given in 'Tahdid' We do know that he had written a book by way of supplement and exposition on Habash s Tables (Zij) entitled (تكميل زيج حبش بالعلل و تهذيب اعماله),

in which he had supplied the proofs and had removed the defects of that famous work It must have been quite a voluminous work of

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1 رسالة البيرونى فى فهرست كتب محمد بن زكريا الرازى، تصحيح پ كراوس، پيرس، سنه ١٩٣٦ع

Epitre de Beruni publiè par Paul Kraus, Paris, 1936

2 الآثار الباقيه (ديباچه سخاو - ص ٣١)

Al-Birûni, as a third of it had as many as 500 pages. This Zij is the same as *Zij-ul-Mumtahan*, referred to by Ibn-i Yûnus.[1]

In 'Al-Qânûn' we have two separate references to the Earth's dimensions, one, very brief, in connection with his argument against the idea of the Earth's rotations on its axis (Part I, Chapter ii) where he refers to the reasons advanced by a contemporary Muslim astronomer—whose name he gives in another place[2]—who actually believed in this theory, and supported it by the fact that a weight falling on the Earth from heights does not fall in a perpendicular line, but always a little to the East. The whole passage is indeed of great importance and interesting in many respects, but I will confine myself for the present to its relevant portions only:—

فامّا انا فقد شاهدتُ أحد من مال الى نُصره هٰذى الرأى من المبرّزين فى علم الهيئة لم يلتزم نزول الثقل الى الارض على القُطر عَموداً على وجهها، بل مُحرّفاً على زوايا مُختلفة، لا بسط فيه و لا تحفظ، و ان الرجل رأى الثقل المُنفصل عن الارض حركتين، احدهما دورية لما فى طبيعة الجزو من نقل الكل فى خواصّه، و الأُخرى مُستقيمة لانحداره الى معدنه . . . . .

و لهٰذا من اعتقاد قوم لهم و ايرادهم فيه الشبهه أرى تقديم معرفة مقدار دور الارض . . . . و ذلك . . . . .

باعتبار اراطسثانس سبع مائة اسادين، كما فى كتاب البُرهان لجالينوس، و على ما ذكره بطليموس فى كتاب صُور الارض خمس مائة. لكن مَعنى هذا الاسم غير معلوم بما عندنا من المقادير *

فلهٰذا جدّد الاصحاب فى ايام المامون، فوجد التلك الزاويه، و حصّتها ستة و خمسين ميل و ثلثي ميل، الميل اربعه الف ذراع سّوداً، هى اربعه عشرون اصبعا *

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[1] Al-Masûdi says that Habash had compiled three Zijs but when one referred to his work by the name of 'Zij', one always meant Al-Mumtahan و اذا قيل زيج حبش مطلقا فانما يراد بها " الممتحن "

[2] The name of this illustrious astronomer is Abû Said Ahmad bin Mohammed bin Abdul Jalil-ul-Sijzi.

و الهند يَدهُون ى هٰده الاميال الىٖ قريب من صَعفها *

و العيان اولىٖ من الحبر، فقد اعتَبَرتُ ذٰلك بارضهم، و حصّلت مقدار انحطاط

قلة جبل ميرنه (نندنه) معلوم العمود، استخرجتُ منه قدر تلك الزاويه، فحام حول السبعه

و الخمسين ميلا، و ذٰلك اعتَمدنا الامتحان المَوصلى *

"I have seen a certain astronomer, who is one of the perfect masters of the science, supporting the theory (of the Earth's rotation) by suggesting that heavy weight does not fall on the Earth in a perpendicular line, but always diverting from it in different angles which have not been yet determined or recorded This gentleman considered that the matter outside the Earth had two movements, one circular, on account of the part naturally being attracted to the whole, and the other straight on account of its being attracted to its own original source

On account of a whole group of astronomers believing in this theory and questioning my arguments (based on the Earth's measurements) I deem it necessary to refer to the subject of the Earth's dimensions And they are as follows —

Evatosthenes had found one degree to consist of 700 stadia as is mentioned by Galen in his 'Book on Reasoning', and 500 stadia as stated by Ptolemy in his 'Book on the Shape of the Earth' The true value of the term 'stadia is unknown (to us) in the terms of our own (familiar) standards (of measurement)

Therefore, the matter was re-examined in the days of Al-Mâmûn They found that the arc formed by the angle (at the Earth's centre) on the lines of meridian is 56⅔ miles, the mile consisting of 4,000 Zirâ-i-saudâ one Zira' having the width of 24 fingers

The Indians on the other hand had calculated double of this length

Actual observations being always preferable to a mere report, I investigated the whole matter in their (i e , the Hindûs') own land (India)

I first obtained the extent of the dip of the horizon on the peak of the mountain of Nandanâ, the altitude of which I had already ascertained and then found the true value of the angle At last I found out a degree as of about 57 miles On this account we have been led to trust the result of (Al-Mamun's) verification at Mausil "[1]

Before we proceed further we should note here that Al-Birûni's version regarding the length of the arc as found by himself varies a

[1] The reference is obviously to the expedition that surveyed an arc at Sinjâr, near Mosul

little in his different accounts, which we shall discuss later on. But we have so far nowhere found support to Nallino's statement that Al-Birûni had found it as 58 Arabian miles.[1]

M. Carra de Vaux also apparently following Nallino's authority has fallen in the same error.

Nallino, however, while testing Al-Birûni's result by means of logarithms found it as 56·94, i.e., just what Albirûni has said in the above quotation.

Al-Birûni finally takes up the whole subject of Al-Mâmûn's survey of the Earth's arc in a much more detailed manner in the ninth chapter of the Fifth Part (مقالة) of Al-Qânûn.

فى معرفة دور الأرض بالاجزاء الاصطلاحية

My quotations of this and all other passages from Al-Qânûn are derived from the old manuscript written in the year 562 A.H. (1166-1167 A.D.)[2] once on loan in the Lytton Library of M.A.O. College, Aligarh (Muslim University, Aligarh) and now in the State Library of Berlin, where it was transmitted by means of theft and sold for a handsome amount by some unknown student from India. I had compared the extracts from it with another copy of more recent date in the Library of the Muslim University, Aligarh, which had once belonged to Syed Mahmûd, the illustrious son of Sir Syed Ahmad Khân, and the father of the late Sir Syed Ross Masûd.

الباب السابع

"فى معرفة دور الارض بالاجزاء الاصطلاحية" *

كرة الارض فى وسط كرة السماء، فالزوايا الكاينة على مركز العالم يفصل

من كليتهما قطعاً متشابهة، سواء كانت سطوحاً مجاريه للزوايا المجسمة، او كانت قسياً

مقابله للزوايا المسطحة. و القسي المتشابهة متفاضل فى العظم بحسب البعد عن المركز *

و يختلف ذكر الامم لمقادير القسي الارضيه بما اصطلحوا عليه فى تقدير المسافات.

فما من بقعة الا و الآ و لأهلها فى الذراع الذى يحملونها معهم فصلاً، اما تعددها اقاويل

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[1] Says Nallino p 292

"فاستنبط ان مقدار درجة من خط نصف النهار ٥٨ ميلاً على التقريب"

[2] For a description of this Manuscript see my *Al-Biruni*, pp 136–138

لعسر هاهنا حصرها، بل يعذر على جامعها تحصيلها، ثم لا يثبت فيهم على الاحقاب و القرون، انّما يتغيّر فى قليل من الزّمان *

و لم تتّصل بنا فى هذا الباب كلام مسند الى ذوى التحصيل غير ما ورد من جهة الرّوم و الهند، و كل واحد فيها مخالف الآخر بمقدار لايكاد يحد له وجه *

و قد قدّر الهند دور الارض بمسافة يشتمل على ثمنة اميال من اميالنا، و اختلف رايهم فى كل الدّور، فذكر فى كلّ واحد من سدّهاندهم الخمسة بخلاف ما فى الآخره، و قدّره الرّوم بمقدار سمّوه اسطاديا، و زعم جالينوس انّ اراطستانوس قدر به ما بين بلدَى اُسوان و الاسكندريه، فانّهما على خط واحد من خطوط النصف النهار مثل بلدى تدمُر و الرّقة، و سيّ جمع ما فى كتاب البرهان لجالينوس الى ما فى كلّ واحد من كتاب بطلميوس فى المدخل فى الصّناعه الكريه و كتابه فى الصّوره الارض، تفاوت المقادير ايضاً، على انّ اسماً تقديراتهم اذا وقعت الينا لم نكن نهتدى بها قوما بسبب اللغة و اختلاف المفسّرين فيها *

و هذا و التّفاوت العظيم بين راى الفريقين فيها هو الّذى بعث فيها المامون بن الرشيد على تجديد الاعتبار فى برية سنجار فى ارض الموصل على يد جماعة من المُتقدّمين فى هذه الصّناعة، فقصدوا معرفة ما يخصّ قوساً من دائره عظمى مَعلوم النّسبة الى كُلّ الدّور من اذرع او اميال او فرسخ *

و كُلّ من لزم فى مسيره طريقا مستقيما على قاع اَمَت فقد سلك محيط دايره عظيمة، الّا انّ لزومها بالاطلاق يصعب لخفاءِ العوَج، فيما تَعدّ من الابعاد و لتغيّر السّمت فى كل جزو من الدّواير العظام ما خلا خط الاستوا و خطوط انصاف النهار *

و لذلك اعتمدوا قطب الكل فى الاستقبال و الاستدبار، و راعوا الشرايط الّتى بها تصحّ استقامة السّير بالنهار و السّرى بالّليل، و حين احاطوا وجدوا حصة الجزو من الثلثمائة و السّتين المفروضة لكلّ الدّور ستّة و خمسون ميلا، و ثلثى ميل، كُل ميل منها اربعة الف ذراع، تُعرف بالسّودا، و تُقدر باربعه و عشرين اصبعاً لمساحة الدّيار

و البيوت ببغداد، وَ كلّ ثلثة اميال منها فرسخ، و لذلك يكون اذرع هذا الجزو مأيتي و ست
عشرين الفاً و ستمائة و ستّ و ستّين ذراعاً و ثُلثي ذراع، و فراسخه ثمنه عشره فرسخاً،
و ثلث و خمسين دقيقة، و اذرع الدور كُلّه ......٨١٦٠، و امياله ..٢٠٣٠٠،
و فراسخه ..٦٨٠ *

"The Chapter IX On Ascertaining the Earth's Circumference by means of its Technical Divisions

The Earth's globe stands in the centre of the Celestial Sphere, so that the angles formed at the centre of the world (the Earth) separate from both of them (i e , the Heavens and the Earth) similar portions, irrespective of the fact that the surfaces opposite to these angles belong to a solid body or happen to be the arcs belonging to a plane surface These similar arcs only increase in their dimensions according to their distances from the centre (i e , more the distant the longer the arcs)

The accounts of the various nations regarding the dimensions of the arc of the Earth differ according to the different standards of measurements adopted by them for the computations of distances There is no place where its inhabitants have not got a separate account of the cubit, which they carry about with them (for their measuring purposes) And then there are so many various versions that it would be tedious to recount them all here Nay, it would be even impossible for anyone desirous of collecting full information about all of them to succeed in his attempt Besides these (standards of measurements themselves) do not persist for generations or succeeding times On the other hand, they change even in short times

No accounts have reached us emanating from those who had made the researches, except, of course from the Greeks and the Hindûs only And every one of these two differs from the other regarding the dimensions of a single degree to such an extent that one is unable to find reasons for it

The Hindûs have computed the circumference of the Earth in the distances which seem to consist of 8 of our (Arabian) miles And their opinions have varied in every period They have mentioned in every one of their five Siddhantas (Astronomical works) calculations contrary to what is given in the others

The Greeks calculated the circumference of the Earth by means of their own standard, which they called 'Stadia' Galen claims that Eratosthenes had measured in stadia the distance between the two cities of Asvan and Alexandria as both of them are situated on the same meridian line like the cities of Tadmur (Palmyra) and Al-Raqqâ.

When the information on this subject as found in the Book of Galen on the Deductive Reasoning (البرهان) is compared with the information available either in 'Ptolemy's Introduction to the Science of Sphere' or in his 'Book on the Shape of the Earth', the dimensions differ in the case of the Greeks similarly Over and above it, when the terms used for their standard of measurements, reached our nations (the Muslims), they were unable to find their way to fix its true length, on account of their being strangers to the (Greek) language, and also owing to the differences amongst their commentators in this respect

All this, and the great differences in the opinions of both the parties, (the Greeks and the Hindûs) led Al-Mâmûn, son of Al-Rashid, to review the actual observations on the plains of Sinjâr, in the country of Mausal, at the hands of a group of the leading astronomers of his times

Those astronomers (of Al-Mâmûn) proposed to ascertain the length of an arc of (the Earth's) great circumference whose (i e , the arc s) relations to the whole circumference is known—in the cubits, miles or farsakhs

Now everyone who has walked on a straight path in a level part of the earth, has really walked on the path of a great circle (on account of the rotundity of the Earth's surface) But to maintain such a straight course is really difficult owing to the inability to detect the divergence (from the straight path), the long distances (to be traversed) and the possibility of a variation in the direction of every part of the great circumferences, except, of course, on the equator or the meridian lines

So Al Mâmûn's astronomers relying on the Celestial Pole (قطب الكل) in its Progression (الاستقبال) and Retrogression (الاستدبار) kept in view the conditions of guaranteeing the maintenance of a straight course in the day as well as in the night

When they had taken every possible care in the matter, they found out one of the 360 supposed degrees (of the Earth's circumference) to be $56\frac{2}{3}$ miles Everyone of these miles consisted of 4,000 cubits of Al-Sauda and every cubit had the breadth of 24 fingers This cubit is in vogue in Baghdad for the measurement of habitations and houses Three of such miles make a farsakh

For this reason this single arc would consist of $226,666\frac{2}{3}$ cubits, or 18 farsakhs and 53 minutes, and the whole circumference 81,600,000 cubits, or 204,000 miles, or 6,800 farsakhs "[1]

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[1] Although Al-Biruni does not say that the calculations, mentioned above, in the terms of the Arabian cubit (ذراع) have been actually worked out in detail by him, we have no doubts that it is all his own work taking $56\frac{2}{3}$ for his basis Our later exposition will make it all clear to the reader

These are the best accounts that we have of Al-Mâmûn's measurements of the arc of the meridian circle But the subject had attracted interest beyond the circle of mere specialists, and its echoes are heard in the works of general historians, biographers, as well as mere litterateurs We have, for instance, such an account in Ibn-i-Khallikân's Biographical Dictionary, *Kitâbul Wafiyât* (كتاب الوفيات لابن خلكان), in the life of Mohammed bin Mûsâ bin Shâkir. We quote the Arabic text from the Egyptian Edition, and the translation from Volume III, pp 322–324 of De Slane's English version (1845) (which though a little antiquated, is not very inaccurate) —

ابو عبد الله محمّد بن موسى بن شاكر احد الاخوة الثلثة الّذين تنسب اليهم "حيل بني موسى"، و هم مشهورون بها، و اسم اخويه احمد، و الحسن، و كانت لهم همم عالية في تحصيل العلوم القديمة و كتب الاوائل، و اتعبوا انفسهم في شانها و انفذوا الى بلاد الروم من اخرجها لهم، و احضروا النقلة من الاصقاع الشاسعة و الاماكن البعيدة بالبذل السني، فاظهروا عجائب الحكمة، و كان الغالب عليهم من العلوم الهندسة و الحِيَل و الحركات، و موسيقى و النجوم، و هو الاقلّ، و لهم في الحيل كتاب عجيب نادر، يشتمل على كُلّ غريبة، و لقد وقفت عليه، فوجدته من احسن الكتب و امتعها، هو مجلّد واحد *

و ممّا اختصّوا به في ملّة الاسلام، و اخرجوه من القوّة الى الفعل، و ان كان ارباب الارصاد المتقدّمون على الاسلام قد فعلوه، لكنّه لم ينقل انّ احداً من اهل هذه الملّة قصده و فعله الّا هم، و هو انّ المامون كان مغرى بعلوم الاوايل و تحقيقها، و رأى فيها انّ دور كرة الارض اربعة و عشرون الف ميل، كُلّ ثلاثة اميال فرسخ، فيكون المجموع ثمانية آلاف فرسخ، بحيث لو وضع طرف حبل على ايّ نقطة كانت من الارض، و ادرنا الحبل على كرة الارض، حتّى انتهينا بالطرف الآخر الى ذلك الموضع من الارض، و التقى طرف الحبل، فاذا مسّحنا ذلك الحبل كان طوله اربعة و عشرين الف ميل *

فاراد المامون ان يقف على حقيقة دلك، فسأل بى موسى المذكورين عنه، فقالوا نعم هدا قطعىّ، و قال اريد منكم ان تعملوا الطّريق الّذى دكره المتقدّمون، حتّى نبصرُ هل يتحرّر ذلك اَم لا، فسألوا عن الاراضى المتساويه فى اىّ بلاد هى، فقيل لهم صحرأ سنجار فى عاية الاستوا، و كدلك و طآب الكوفة، فاخذوا معهم جماعة ممّن يثق المامون الى اقوالهم، و يركن الى معرفتهم بهذا الصّناعة، و خرجوا الى سنجار، و جاؤا الى الصحرأ المذكوره، فوقفوا فى موضع منها، فاخذوا ارتفاع القطب الشّمالى ببعض الآلات، و ضربوا فى ذلك الموضع و تداوراً بطوافه حبلاً طويلاً، ثم مشوا الى جهة الشماليه على استوا الارض من غير انحراف الى اليمين و اليسار حسب الامكان، فلمّا فرغ الحبل نصبوا فى الارض وتداً اخر، و ربطوا فيه حبلاً طويلاً، و مشوا الى جهة الشمال ايضاً كفعلهم الاول، و لم يزل ذلك دابّهم، حتى انتهوا الى موضع اخذوا فيه ارتفاع القطب المذكور، فوجدوه قد زاد على الارتفاع الاول درجة، فمسحوا ذلك القدر الّذى قدروه من الارض بالحبال، فبلغ ستّة و ستّين ميلاً، و ثلثى ميل، فعلّموا انّ كل درجة من درج الفلك يقابلها من سطح الارض ستّة و ستون ميلاً و ثلثان، ثم عادوا الى الموضع الّذى ضربوا فيه الوتد الاول و شدّوا فيه حبلاً، و توجّهوا الى جهة الجنوب، و مشوا على الاستقامة، و عملوا كما عملوا فى جهة الشّمال من نصب الاوتاد، و شد الحبال، حتّى فرغت الحبال الّتى استعملوها فى جهة الشمال، ثم اخذوا الارتفاع، فوجدوا لقطب الشمالى قد نقص عن ارتفاعه الاوّل درجة، فصحّ حسابهم، و حققوا ما قصدوه من ذلك۔ و هذا اذا وقف عليه من له يد فى علم الهيئة ظهر له حقيقة ذلك، و من المعلوم ان عدد درج الفلك ثلثمائه و ستّون درجة، لانّ الفلك مقسوم باثنى عشر برجاً، و كل برج ثلاثون درجة فيكون الجملة اربعه و عشرين الف ميل، و هى ثمانيه آلاف فرسخ، و هذا محقّق، لا شكّ فيه، فلمّا عاد بنى موسى الى المامون، و اخبروهُ لما صنعوا، و كان مُوافقه لما رآهُ فى الكتب القديمه من استخراج الاوايل، طلب تحقيق ذلك فى موضع آخر، نسيّرهم الى ارض الكوفة، و فعلوا كما فعلوا فى سنجار، و توافق الحسابان، فعلم المامون صحّة ما حرّروه القدماً فى ذلك *

و توفّي محمّد المذكور في شهر ربيع الأوّل سنة سبع و خمسين و مأتين، رحمه الله تعالى - و الله اعلم بالصواب *

* (الوفيات المطبوعة في مطبع الميمنة سنة ۱۳۱۰ه ج ۲ ص ۷۹-۸۰)

"Abû Abdullâh Mohammed Ibn Mûsâ Ibn Shâkir was one of the three brothers after whom the art of Engineering was called the contrivances of the sons of Mûsâ [1] Mohammed, Ahmed and al Hasan, these three brothers being celebrated for their talents in that line

Animated with the noble ambition of learning the sciences of the ancients and acquiring their books they laboured to effect this object and sent persons to bring these books from the country of the Greeks By the offer of ample rewards, they drew translators from distant countries, and they thus made known the marvels of science Geometry, Engineering, the movements of the heavenly bodies, Music and Astrology were the principal subjects to which they turned their attention But these were only a small number (of their acquirements) They composed on Engineering an original and curious book, filled with the most extraordinary (facts), I met with a copy of it, in one volume, and found it to be an excellent and highly instructive production

A thing which they, the first in Islamic times, brought from theory into practice was the measurement (of the Earth), for although astronomical observers in ancient times, anterior to the promulgation of Islamism, had executed the operations, yet no statement exists to prove that it had been attempted by any person of this religion, except by themselves

The (Caliph) Al-Mâmûn had a strong predilection for the sciences of the ancients, and a great desire of putting their exactness to the test Having read in their production that the circumference of the globe is twenty four thousand miles, or eight thousand farsangs, (three miles make a farsang), and that if one end of the cord were placed at any point of the surface of the Earth and the cord passed round the Earth till the two ends met, this cord would be twenty-four thousand miles long, he wished to prove the truth of this assertion and asked the sons of Mûsâ what was their opinion They replied that the fact was certain and he then asked, 'I wish you to employ the means indicated by the ancients so that one may see whether it be correct or not' On this they inquired in what country a level plain could be found, and being informed that the desert of Sinjâr was perfectly level as also the country about Kûfâ, they

[1] It would be more correct to say that the contrivances of Banû Mûsâ have reference to them, and they are famous for the same

took with them a number of persons on whose veracity and skill in this art Al-Mâmûn placed reliance, and set out for Sinjâr. On arriving in the plain just mentioned, they stopped at a spot where they took the altitude of the North Pole by means of certain instruments and drove a picket into the place where observations were made. To this picket they fastened a long cord and walked directly towards the North, avoiding as much as possible, any deviation to the right or to the left. When the curve was run out they set up another picket and tied to it a cord, after which they walked towards the North as before. They continued the same operation till they came to a place where they observed the altitude of the Pole and found it to surpass by one degree the altitude observed at the first station. Having already obtained the length of the intermediate space by means of the cord, they found the distance to be sixty-six miles and two-thirds of a mile. From this they learned that every degree of the Zodiac[1] corresponded to a space of sixty-six miles and two-thirds on the surface of the East. They then returned to the place where they had driven in the first picket, and, having fastened a cord to this picket, they went directly to the South, operating as they had previously done when going towards the North, that is, setting up pickets and fastening cords. When the cords employed in the operation directed towards the North were again run out, they took altitude of the North Pole and found it one degree less than the altitude first observed. Their calculations were thus verified and the result of their undertaking confirmed. Persons acquainted with Astronomy will understand this at the first glance. It is well known that the number of degrees in the Zodiac is three hundred and sixty, for the Zodiac is divided into twelve signs, and each sign into thirty degrees. These are, therefore, three hundred and sixty degrees in all, and if this sum be multiplied by sixty-six and two-thirds—the number of miles in a degree, we obtain twenty-four thousand miles, or eight thousand farsangs (for the circumference of the Earth). This is certain and undubitable.

When the sons of Mûsâ returned to Al-Mâmûn and informed him of what they had done (he perceived that the result) corresponded with what he had read in the books of the ancients relating to the deduction of that people, and wishing to verify the fact elsewhere, he sent them to the land of Kûfa, where they operated as they had done at Sinjâr. The two calculations agreeing Al-Mamûn acknowledged the truth of what the ancients had written on the subject.[2]

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[1] It would be more correct to say that every degree of the meridian of the great circle of the sphere. The word in the text is درج and not برج

[2] In another place (Volume III, pp. 72-73 of De Slane's English translation) Ibn-i-Khallikân has stated that the Earth's circumference is 8,000 farsangs, so that

Mohammed Ibn Mûsâ died in the month of first Rabi A.H. 259 (January, 873 A.D.)."

Ibn-i-Khallikân's account of the survey of the Earth's dimensions by the sons of Mûsâ as given above has rightly been subjected to a drastic criticism by Nallino on various grounds.[1]

We do not know the original sources of Ibn-i-Khallikân's information on this subject. There is one most evident error in it, i.e. the length of the arc as measured by Al-Mâmûn's astronomers is shown as 66⅔ miles. This is not a mere slip of pen for 56⅔ miles, the value generally ascribed to those astronomers. This is on the other hand evidently due to the substitution of Ptolemy's measurements for those of Al-Mâmûn's times. Ptolemy had given 66⅔ miles as the length of a degree as 24,000 miles as the length of the circumference.[2]

Similar misunderstanding is traceable in the accounts of Al-Masûdi and Ibn-i-Rabbân which have already been quoted by us in the above.

M. Carra de Vaux relying on the various accounts and also benefiting from Nallino's discussions, has briefly described Al-Mâmûn's operations, in his interesting book 'Les Penseurs de l'Islam' (Volume III, pp. 27–29), from which I translate the whole passage in the following :—

'The Khalifa Mâmûn wanted to take up afresh the question of the Earth's circumference. He gathered a group of savants to whom he gave orders to measure a degree of the meridian. The method followed by them was different from the ancient methods.

These savants gathered at a point in a vast plain, thence parting in 2 groups, one marching to the North—going straight to the Pole to the extent of a degree's altitude, the other marching to the opposite side to the extent of the lowering of the North Pole by a degree.

Then they measured the path they had thus traversed. They rejoined and compared their results. One party had found it as 56⅔ miles, the other as 56. They took the mean by definitely adopting the bigger of the two operations,[3] i.e., 56⅓.

The mile had 4,000 metres of 27[4] fingers amounting to oM 58. The measurement of the circle came to 47,325 kilometres, being slightly in excess.[5]

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if the end of a cord were laid on any part of the Earth and the cord passed completely round the Earth's body, the length of the cord would be equal to 24,000 miles or 8,000 farsakhs.

[1] 'The Lectures', p. 286.

[2] See Nallino's Lectures, pp. 278-279.

[3] It is not correct as we shall see later on.

[4] Apparently a misprint for 24.

[5] Based on Nallino's calculations.

Once this operation was over, we are told, it was repeated several times

Masûdi speaks of one survey in the plains of Sinjâr, of which the results are stated in the above, another between Kûfa and Madinat-us-Salâm (Baghdad), and a third between Palmyra and Raqqa Ibn-i-Yunus speaks of an operation in the sandy plains of the Euphrates between Palmyra and Wama '[1]

The last in time, but not the least in importance, is the account given by Abul-Fazl in his Âin-i-Akbari based on Nàsir-ud-din Tûsi[2] and his pupil Qutb-ud-din Shirâzi's[3] works It throws some more light on the history of Al-Mâmûn's measurement of the arc

بیستیان بدین کار کرد حصهٔ یک درجه بیست و دو فرسخ و دو تسع، که
شصت و شش میل و دو ثلث بود، یافتند *

چون بحکم مامون بیابان سنجار نزد موصل بدین کار برگزیدند، خالد بن
عبد الملک مروروذی با برخی شناسندگان بشمال روانه شد، و علی بن عیسی اصطرلابی
با لختی از هوشمندان بجنوب، پیش گروه یک درجه بیش یافتند، و پس یک درجه
کم، هر کدام راه خود را چون پیموده بودند فرسخ تسع کم برآمد، که پنجاه و شش
میل و دو ثلث باشد ـ تفاوت میان دو پیمود بدو ثلث میل یافته شد ـ مامون آزمایش
این دو گروه پرسید که از مکه تا بغداد چند است، بدان حساب دوازده درجه و چهل
چهار دقیقه تقریباً در پنجاه و شش میل و دو ثلث که حصهٔ یک درجه است ضرب کرده
بر گزاردند، که هفتصد و بیست کروه است تخمیناً، فرمودهٔ خلیفه راست‌ترین
و هموارترین راه که میان این دو شهر بود گز کردند، اندک تفاوت برآمد *

شگرف آنکه محقق طوسی در تذکره یافت پیشینیان را بسبب حکمای زمان مامون
می‌کند که در صحرای سنجار اندازهٔ یک درجه گرفته، و ملا قطب الدین شیرازی
در تحفه و دیگر تصانیف خود رای متاخران را نظری که گذارش یافت بدانشوران
آن خلیفه بر گزاردند ـ همانا قلم را در تذکره لغزش رفته *

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1 Carra de Vaux refers to his French translation of Masûdi's Kitâb-ul-Tanbih *'Le Livre de l'avertissement'*, p 44

Wama is a copyist's mistake for Raqqâ The last reference therefore, is redundant and mistaken

2 Died in 672 A H (1274 A D)

3 Died 710 A H (1311 A D)

و هدی حکیم یک درحه را چهارده حوحں و چهار صد و سی و شس دىد
و دو دسب و چهار انگشب ىر گویند، و همان پیشیں روش سر اید *
(حلد متعلق احوال هدوستان ص ١٦ آئیں اکبری مطبوعۀ سر سد احمد حاں
مرحوم، دهلی، سىه ١٢٧٣ھ) *

"The ancient (astronomers) found the length of one degree to be 22 farsakhs and two-ninths of a farsakh, which come to 66 and two-thirds of a mile

When by Mâmûn's orders the plains of Sinjâr near Musal, were chosen for this work Khâlid bin Abdul Malik of Marv-Rod with a number of other savants started to the North, and Ali Ibn-i-Isâ, the maker of astrolabes, with another party of scholars went to the South The former party found the degree to be a bit longer, while the other party found it a bit shorter (with the result that everyone of them, when they measured their own paths, found that their path was 19 farsakhs minus one-ninth of a farsakh, which came to 56 miles and ⅔ of a mile The difference between the two measurements amounted to ⅔ of a mile only

Mâmûn, in order to test these two parties, asked them to find out the distance from Mecca to Baghdâd which was about 12 degrees and 44 minutes multiplied into 56⅔ miles It was found to be about 727 Kroh On the order of the Caliph the most straight and level route between the two cities was measured with the cubit and was found having little difference

It is extremely strange that Muhuqqiq-e-Tûsi in his Ta<u>dh</u>kirâ ascribes the researches of the ancient astronomers to the savants of Mâmûn's times who calculated the length of a degree in the plains of Sinjâr, while Mulla Qutb uddin-i-Shirâzi in his Tuhfâ and other works gives the results of the later scholars in the manner in which I have given in the above It appears that there is a slip of pen in Ta<u>dh</u>kirâ [1]

The Hindû scientists have found the value of a degree to be 14 yojanas and 60 dandas and 2 hands and 4 fingers, and this tallies with the previous calculations"

These are the various important accounts we have of the measurement of a degree of the Earth's circumference in Al-Mâmûn's times

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[1] It is unnecessary to remind here that like Ibn-i-Khallikân Tûsi had also confused the Greek researches with those of Al-Mâmûn's times Shirazi, on the other hand, is evidently much better informed, but from Abul-Fazl we are unable to ascertain the original sources of Shirazi's information

As we have already mentioned even our best accounts on the subject are not free from considerable differences both in respect of the details and the results ascribed to al-Mâmûn's astronomers

This has naturally led to much confusion in the subsequent writers, who have preferred the one or the other of these versions, or tried to strike some sort of mean between them For instance, Abul-Fidâ, following the majority, adopted 56⅔ miles in his Tables (*Taqweem-ul-Buldân*), and the learned Abdul Ali Birjandi[1] 56⅓, obviously taking the mean between 56⅔ and 56

Only three of our earliest authorities, Al-Masûdi, Ibn-i-Yûnus, and Al-Birûni claim to base their accounts on the original contemporary sources

Al-Masûdi and Al-Birûni derived their information about 56 miles as the value of the arc from Habash It is clear from Al-Birûni's statements in *Kitâb-ul-Tahdid* that Habash himself had got it from Khâlid, one of the leading members of the expeditions of Sinjâr Al-Birûni had derived this information from Habash's 'Book on the Distances of the Stars', while Al-Masûdi from his 'Astronomical Tables' (Al-Zij) It was also confirmed by the subsequent account as given by the famous astronomer Thâbit bin Qurrat-ul-Harrani $\left(\frac{288 \text{ A H}}{901 \text{ A D}}\right)$

On the other hand the majority, like Al-Farghâni, Ahmad bin Mohammed bin Kathir $\left(\text{c } \frac{247 \text{ A H}}{861 \text{ A D}}\right)$, however, do not claim to base their information on any written records prepared by any of Al-Mâmûn's astronomers

As to Ibn-i-Yûnus, he traces his information about 57 miles, as the value of the arc, directly from Sanad bin Ali (Abul Tayyib) who according to Ibnul-Nadim,[2] the author of Al-Fihrist, participated in all the astronomical observations of Al-Mâmûn's times, and was one of the leading spirits in the operations between Palmyra and Raqqâ

According to Habash, as quoted by Ibn-i-Yûnus, the length of the arc was found to be 56¼ miles on the plains of Sinjâr We have therefore, two different versions of Habash, one in Al-Birûni and Al-Masûdi giving 56 miles and the other in Ibn-i-Yûnus giving 56¼ miles, both relating to the same locality, i e, Sinjâr in Mesopotamia

We have thus the following different measurement of the arc ascribed to Al-Mâmûn's times —

(1) 57 miles according to Sanad bin Ali in Ibn-i-Yûnus, between Tadmur and Raqqâ

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1 He was alive in A.H 930 (1524 A D)
2 Died 835 A H (995 A D)

(2) 57 miles at Sinjâr, according to one account of Al-Birûni (in Al-Qânûn)
(3) 56¼ miles in Sinjâr according to Habash in Ibn i-Yûnus
(4) 56 miles in Sinjâr according to Habash in Al-Masûdi, and Al-Birûni (in Tahdid)
(5) 56⅔ miles according to Al-Birûni in Al-Qânûn, Al-Tafhim and many other writers, all referring to the operations in Sinjâr

In this connection it is further noteworthy that according to Al-Birûni Sanad bin Ali's party as well as the other party both carried out their measurements in the plains of Sinjâr only, while according to Ibn-i-Yûnus Sanad and his party carried out their measurement between Palmyra and Raqqâ

Al-Birûni, while discussing the two divergent versions of 56 and 56⅔ miles in his Tahdid, was inclined to guess that the differences were due to two distinct findings by Al-Mâmûn's astronomers working in the same plains and at the same time He was right that although the difference may appear nominal to the layman, to the scientist it must be a matter for wonder, necessitating fresh and independent verification

It is, however, amply evident that there were more than one measurement in Al-Mâmûn's times We are quite sure of the two mentioned by Ibn-i-Yûnus, one at Sinjâr and the other between Palmyra and Raqqâ In spite of some very cogent objections raised by Nallino, I am inclined to believe also the third one, between Kûfa and Baghdâd

However, none of the original and contemporary authorities mention 56⅔ as the result of any actual observation by Al Mâmûn's astronomers I am, therefore, most strongly inclined to agree with Nallino that 56⅔ miles was adopted as a compromise value between the two actual results of 57 and 56¼ miles, and passed subsequently as the real finding of Al Mâmûn's scientists[1]

This further leads us to think that Habash modified his information by referring to some better sources than he had at the time when he wrote his *Zij-ul-Mumtahan* In my opinion Ibn-i-Yûnus' account is on the whole the best and most reliable of all those we have on the subject

We shall discuss later on the true worth of these measurements of Al Mâmûn's times, as we have yet to record another important

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[1] Says Nallino —

و الصحيح انّما هو استخرج من زيج ابن يونس و كتب غيره أنّ جماعة من الفلكيين قاسوا قوساً من خط نصف النهار على صحراوين، اى القريبة من شمالى تدمر و برية سنجار ـ ثم حاملوا العملين اختلفا بين ٥٦¼ ميل و ٥٧ ميلاً ـ فاخذ متوسطهما، اى ٥٦⅔ تقريباً (علم الفلك ص ٢٨٤) ٠

measurement of the Earth carried out personally by Al-Bîrûnî in India

Having, owing to practical difficulties, failed in his attempts to verify Al-Mâmûn's results by resorting to direct measurements of an arc, Al-Bîrûnî had recourse to a novel method of his own contrivance, which, before he actually carried it out into practice had already been fully indicated by him in his earlier book on the astrolabe (الكتب فى الاسطرلاب)[1]

و فى معرفة ذلك طريق قايم فى الوهم صحيح بالبرهان، و الوصول الى عمله صعب لصغر الأسطرلاب (او الآلات)[2]، و قلة مقدار الشئ الذى نبنى عليه فيه، و هو ان نصعد جبلاً مشرفاً على بحر او برية ملساً، و نرصد غروب الشمس، فنجد فيه ما ذكرناه من الانحطاط، ثم نعرف مقدار عمود ذلك الجبل و نضربه فى الجيب المستوى لتمام الانحطاط الموجود، و نقسم المجتمع على الجيب المنكوس لذلك الانحطاط نفسه، ثم نضرب ما خرج[3] من القسمه فى اثنين و عشرين ابداً و نقسم المبلغ على سبعه، فيخرج مقدار احاطة الارض بالمقدار الذى به قدرت عمود الجبل *

و لم يقع لنا بهذا الانحطاط و كميته فى المواضع العاليه تجربة ـ و جرانا على ذكر هذا الطريق ما حكاه ابو العباس النيريزى عن ارسطولس ان اطوال اعمده الجبال خمسه اميال و نصف بالمقدار الذى به نصف قطر الارض ثلثه آلاف و مائتا ميل بالتقريب، فانّ الحساب يقضى لهذه المقدمه ان يوجد الانحطاط فى الجبل الذى عموده هذا القدر ثلث درجات بالتقريب *

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1 This is quite a different book from Al-Bîrûnî's الكتاب الاستيعاب الوجوه الممكنه فى صنعة الاسطرلاب, another book on the same subject, a unique copy of which exists in Leyden (B d, 1908, p 67) I have quoted the whole passage in the above from Nallino (Lectures pp 289-292)

' ان ذلك العالم الاجلّ جعل فى آخر كتابه فى الاسطرلاب فصلاً فى معرفة مقدار استداره الارض ' و لقد وصف الطريق الاعتيادى المدقق لذلك ' (نالينو) ه

2 و فى الاصل '' الالات '' ه

3 و الصواب '' ضعف ما خرج '' ان خارج القسمة هو نصف قطر الارض ، و لا القطر كله .

(Nallino)

و الى التجربة يلتجأ فى مثل هذه الاشياء، و على الامتحان فيها يعوّل *

و ما توفيقى الّا من عند الله العزيز الحكيم *

'To know this method is quite conceivable in imagination, and it rests on sound deductions It is difficult to carry it out in practice only owing to the smallness of the astrolabe (or other instruments) and the little size of the thing on which we have to base our solution And that method is this You climb a mountain situated close to the sea or a level plain, and then observe the setting of the sun and find out the dip of the horizon we have already mentioned, and then find the value of the perpendicular of this mountain. You multiply this height into the sine of the complementary angle of the dip, and divide the total by the versed sine of this dip itself Then multiply (the double of) the quotient into 22 and divide the result of this multiplication by 7 You will get the length of the Earth's circumference (in the same terms or proportion) in which the height of the mountain has been fixed

We have not so far been able to experiment with this dip, and its value in any high place We were led to this method by Abul Abbas Al-Nairizi[1] who states, that Aristothenes (?) has mentioned that the heights of the peaks of the mountains would be 5½ miles when the length of the radius of the Earth is 3,200 miles approximately

For the solution of this problem it is necessary mathematically that the dip of the horizon in the mountain wherein the perpendicular is so high should be about ⅓ degree

Such matters however, need actual experiments and could be verified only by testing

The Almighty and Wise God alone can help me (in obtaining success in such ventures) [2] '

At the time of writing the Book on the Astrolabe' (الكتاب فى الاسطرلاب) Al-Birûni had not yet made any actual attempt to put his theory into practice owing to, what he thought, the smallness of the instruments of observations, and lack of suitable site, and competent helpers The method required the presence of a mountain either situated on a level plain or adjacent to the sea, and on the peak of it the observations of the sun setting in the horizon.

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[1] Al-Nairizi died shortly after 300 A H (early tenth century A D)

[2] Nallino has demonstrated Al-Birûni's methods on pp 291-292 of his Lectures See Appendix I of this book

3

He did not, however, despair of the idea. The opportunity actually came to him when he was, most probably, kept as a political detinue[1] in the fort of Nandnâ[2] after the conquest by Sultân Mahmûd in 407 A.H. (1016-1017 A.D.) of Al Bîrûnî's native land of Khwârizm, where he had occupied a very prominent position under the royal patronage.

Al-Bîrûnî's researches in India have so far received no adequate treatment. It is a pity that even the most learned Nallino, for whose comprehensive and deep learning I have the greatest respect, has not dealt with them in detail, and in his Lectures, has only contented himself with a very cursory[3] reference. Others have been still more sketchy, and superficial.

Al-Bîrûnî must have elaborately dealt with this subject, which had so much fascinated him for long, in his book 'An Essay on the ascertainment of the Earth's Dimensions by the observation of the declining sun from the peaks of the mountains'[4], mentioned in his Bibliography composed in 427 A.H. (1035-1036 A.D.). We have not so far been able to trace the existence of this small book in any of the libraries of the world.

However, references to the subject, more or less detailed, exist in other works of Al-Bîrûnî that have survived the ravages of about a thousand years.

He has barely referred to it in *Al-Tafhim*, which is only an elementary book, but a more explicit reference exists in *Tahdid-ul-Amâkin* (تحديد الاماكن), an incomplete extract from which has been reproduced from Al-Bîrûnî's autograph copy by Zeki Validi in Al-Bîrûnî's 'Picture of the World'. It is, however, a pity that the learned Editor has omitted to quote the most important portion of the text that directly concerns us, and is of the greatest

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1 This must have been of a very short duration as 2 years later we find Al-Biruni occupied in his astronomical observations at Ghazna.

2 The historical site where sometime before 416 A.H. (1023-1024 A.D.) and after 407 A.H. (1016-1017 A.D.) Al-Biruni carried out his measurements, is fully described by Sir Aurel Stein in the Geographical Journal for July 1932, pp. 31-39.

3 This is all that he says on the subject —

It is worth mentioning that al-biruni after the completion of his treatise on Astrolabe actually put this theory to practical test in his book known as Al-Qanûn-ul-Masûdi.

Wishing to verify Al-Mâmûn's calculations he chose a mountain in the land of Ind near the Sea and a level plain. There he measured the altitude of the mountain and found it to be 652½ yards and the dip of the horizon as 34 degrees. He thereby calculated the degree of the meridian circle as 58 miles approximately.' (p. 292).

As we shall see the value of the degree by Al-Biruni is really much less.

4 مقالة في استخراج قدر الارض برصد انحطاط الافق عن قلل الجبال .

scientific and historical value,[1] that is, the whole detailed account, which must be existing in the manuscript, of the actual calculations carried out by Al-Birûni to satisfy himself of the true dimensions of the Earth as given by Al-Mâmûn's astronomers

We quote the incomplete passage

ص ۲۴۴ و لمّا اتفق لی المقام بقلعه ننده من ارض الهند، و اشرف من الجبل المُطل علیها غربیا، و عایَنتُ البیدا الجنوبیه عنه، بدأ لی ان امتحن هذ الطریق (ای طریق معرفة عمود الجبل[2]) بها، فقست علی قلة الجبل ما یحس من التقا الارض و الملون اللازوردی . . . . *

(ص ۲۴۵) فخرج امیال الجزؤ الواحد نه نح نه *

'(Page 244) When I happened to be living in the fort of Nandnâ in the land of India, and I found a high mountain standing to its West, and also saw a plain to its South, it occurred to my mind that I should examine this method there

Then I calculated on the peak of the mountain the line touching the surface of the Earth and the blue sky .

(Page 245) The length of one single degree came out to be 55 miles 58' 55"

Fortunately we have a more detailed account of it in Al-Birûni's Al Qânûn, where he says, after dealing with Al-Mâmûn's measurements —

و عاق بشدّة حرصی ان اتوقّ الاختبار، و اختاری لَهُ قاتماً صَمصَماً فی شمال دهستان التی بارض جرجان، ثم عجزی عن المساور المتعبه و المعین الصادق علیه، عدلت فیه الی طریق آخر *

لمّا وجدتُ بارض الهند جبلاً مشرفاً علی صحرا مستویة الوجه، بان استواؤها عن ملاسة سطح البحر، فقستُ علی ذروته مُلتقی السما و الارض فی المنظر، اعنی دایره

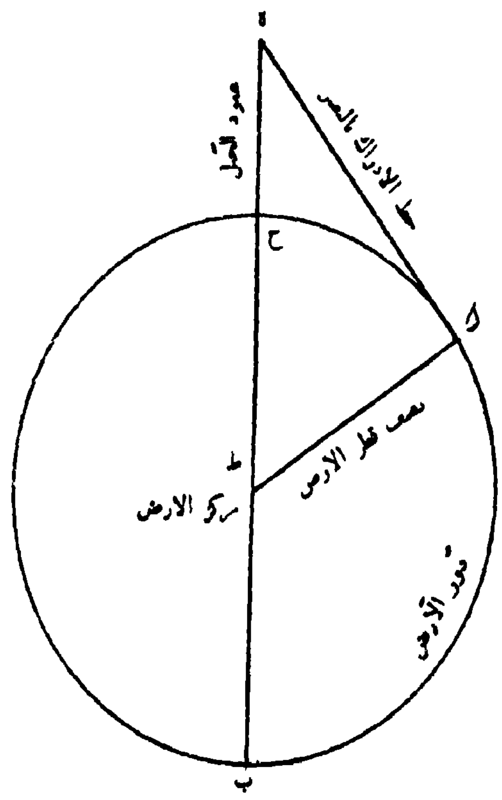
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[1] We wrote to the learned Editor to his address in Istanbul requesting him to furnish us with the copy of the missing portions of the passage, but most probably owing to the war conditions prevalent in these days, we failed to receive his reply

[2] This note in the text in the brackets which we have left out in our English translation in the above is evidently by the Editor and is, I imagine due to the misunderstanding of the real meaning of Al-Biruni as the height of the mountain is a known quantity to start with and is to be one of the bases on which the solution of the problem rests, the other being the finding out of the angle of the dip of the horizon All this would be clear to the reader as he proceeds further

الاوى، فوحدتُه سحطاً ى الآلة عں حط المَشرو و المعرب بالنّقص قليلاً مں ثلث و ربع حزو، فاحديه اربع و ثلثيں دقيقة، و استحرحتُ عمود الحبل باحد ارىفاع ذُروته ى موصعيں هُما مع اَصل العمود ى حط مستقيم، فوَحَدتُه سَمَاىة و اثىيں و حمسيں دراعاً و نصف عسر دراع *

و لىكں عمود الحبل هح نايم على ابح كره الارض، و نحرحه على اسقامته على حطب، و لا بُدّ مں مروره على المركر لهبوط الاتقال اليه، فلىكں ط، و الحط



المماس للارض مں الدروه هو المارّ على الاوى، فلىكں ها، و نصل طا، وتحصل مثلث هطا، قايم زاويه، آ معلوم الروايا، و دلك ان روايه اهط ىمقدار ىمام انحطاط الاوى، و دلك وط كو وحيه. ىط ىط مط ب، و راوىة هط ىمقدار الانحطاط نفسه، و هو . لد، وحسه . . له لو، و هو ادں معلوم الاصلاع ىالمقدار الدى به طه الحيب كله، و دلك انّ طا يكوں فيه حيب ىمام الانحطاط، هح . يكوں فصل الحيب كله على حيب تمام

الانحطاط، و ذلك . . ى لو لب، و ستته الى طا حيث تمام الانحطاط كنسبة ادرع هح عمود الجبل الى ادرع طا نصف قطر الارض *

فيكون ادرع نصف قطر الارض ١٢٨٥١٣٦٩ ن مب، و ادرع المحيط ٨٠٤٨٠٠٣٩ ا لح، و ادرع الجزء الواحد من ثلثمائة و ستين جزواً ٢٢٣٣٨٨ ط ن و يكون اميال الجزو نو . ن و *

فقد قارب ذلك وجود القوم بل لاصقه، و سكن القلب الى ما ذكروه، فاستعملناه اذ كان آلاتهم ادق و تعبهم فى تحصيله اشد و اشق *

و طريق تحويل اميال المسافات الى الاجزا ليمكن من عمل ما تقدم فى سائر الابواب ان تضرب فى ثلثه ليصيرا ثلاثا، و يقسم على مايه و سبعين التى هى اثلاث اميال الجزو الواحد *

و فى عكسه اذا اريد تحويل اجزا مسافة الى الاميال ان نضرب فى مايه و سبعين، و يوخذ ثلث المبلغ، لكن ضرب هذا المبلغ فى عشرين دقيقة ينوب عن القسمه على ثلثه، فلذلك يجب ان يضرب اجزا المسافة فى مايه و سبعين، و ما اجتمع فى عشرين دقيقه ليحصل اميالها *

" My extreme anxiety to verify the matter for myself, and my choosing (for this purpose) a level plain in Northern Dihistân in the land of Jurjân, and eventually my failure to exacting difficulties and want of earnest helpers in the task, led me to adopt another method for it

When in the country of India I found a mountain adjacent to a levelfaced plain, I first ascertained its height at the sea level I then imagined the sight line passing on its peak and connecting the Earth with the sky, that is, the horizon (دائره الافق) I found through my instrument that its horizon inclined from the Eastern and Western lines a little less than ½ and ¼ degree So I took the dip of the horizon as 34 minutes I then ascertained the altitude of the mountain by taking the heights of its peak in two different places, both of which were in a line with the bottom of the mountain's perpendicular I found it $652\frac{1}{20}$ cubits

Now the mountain's perpendicular هج stands errect on اج, the Earth's sphere, we carry it straight down to حطس, which would necessarily pass through the Earth's centre ط on account of the attraction of the heavy weights to it Now the tangent touching the Earth from the peak of the mountain ه passing to the horizon is ها We join طا, and ا, and thus is formed the right-angled triangle هطا, of which the angle at ا is known to be the right angle, and the values (of the other two angles) are also known, the angle اهط, being equal to the complementary angle to the dip of the horizon having 89 degrees and 26 minutes, with a sine of $0^p, 59', 59'', 49''' 2''''$, and the angle هطا being equal to the dip of the horizon itself, that is, 34', with a sine of $0^p, 0', 35'', 36'''$ And thus this triangle will also be of known sides in the proportion in which طه will be sine 1 (i e , 90 degrees) and طا (half chord) will be sine for the complementary angle to the dip of the horizon Therefore هج would be the excess in the sine 1 over the sine for the complementary angle to the dip of the horizon, and would come to $0^p, 0', 0'', 10''', 57'''', 32'''''$, and its ratio to طا, the sine for the complementary angle to the dip, would be the same as the ratio of the cubits of هج the perpendicular of the mountain (i e , $652\frac{1}{20}$ cubits) to the cubits of طا the radius of the Earth

In this manner the radius of the Earth would be 12 851,369 cubits 50′ 42″ and the circumference 80,780,039 cubits 1′ 38″, and a single one of the 360 degrees 224,388 cubits 59′ 50″

The miles for a single degree would amount to 56° 0′ 50″ 0‴

This result (of mine) comes very close to the finding of those people (i e , Al-Mâmûn's astronomers) Nay, it actually corresponds with it, and so my mind was (at last) set at rest (and satisfied) about their reports

We have, however, used their measurement, as their instruments were more precise, and their labour to obtain it of an extremely exacting and fastidious nature

As to the way for converting the miles of the distances into the degrees of the meridian circle, so that the previous process may be available in all cases, let us multiply it by 3 so as to make it threefold, and divide it by 170 which represents thrice the miles of a single degree

On the contrary, when it is intended to convert the degrees of a distance into miles let us multiply them into 170 and divide the result by 3

But since the multiplication of the result into 20′ is the substitute of the division of it by 3, therefore it is necessary that we multiply the parts of the distances into 170 and the result into 20′ (i e , into $\frac{20}{60}$ miles) so as to get the miles ''

Having given a detailed and exhaustive account of Al-Mâmûn's and Al-Birûni's measurements of the Earth we have now to see their true value in the light of our modern knowledge For this purpose we have first to convert them into some well-known current system of measurements

Thanks to the labours of the late Mahmûd Pâshâ and Nallino the correct length of the Arabian cubit (ذراع) of Al-Mâmûn's times has been precisely ascertained Let us see what Nallino has got to say on this subject

'The modern scholars continued to differ in their discussion about the real nature of this Arabian Zirâ', and the difference continued for many years, till I demonstrated by means of the reasons, the details of which would take us long, that the Zirâ el Sauda (ذراع السوداء) corresponds with the "Zira'" recognized by the Muslim law (الذراع الشرعية) Then I succeeded in positively determining the value and found it to be 4,933 millimetres, and the mile as 19,37[illegible] metres

The calculation does not differ from that of the late Mahmûd Pashâ, the well known astronomer by more than 40 centimetres only, i e , so slightly as to be not even worth our while to mention it in this place[1]' (Lectures pp 288-289)

Relying on Nallino's researches we further find that 4,000 Zira' amount to 6,473 feet (English Encyclopaedia of Islam, p 408)

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1 ان الحكم في قد ضبط قياس العرب تتلق بمعرفة طول الميل العربي المستعمل فيه، المشتمل على اربعة آلاف ذراع سوداء على قول احمد بن محمد ابن كثير الفرغاني و المسعودي، و البيروني و ابي نصر الحسن القمي (من ملكي القرن الرابع) و ابن يونس، و اختلف آراء المحدثين الباحثين في مقدار ذلك الجنس من الذراع، و لم يزل الاختلاف مدة سنين مديدة - ثم انّي رهنت ببراهين يطول شرحها على ان اسمه الذراع السوداء للذراع الشرعية، و توصلت الى اثبات مقدارها - فوجدته ٤٩٣،٣ ماليمتر، فاستنبطت ان الميل العربي كان ١٩٧٣،٢ متر - فهو قدر لا يختلف عمّا حده المرحوم محمود باشا الفلكي الّا بأربعين سنتمتراً، اي شيء لا يذكر.

Now according to learned Nallino the length of the degree 56⅔ miles, as found by Al-Mâmûn's astronomers would amount to 111,815 metres and that of the whole circumference 41,248 kilometres, which he adds, is so very near to the reality,[1] as to deserve to be counted as a great scientific achievement of the Arabs

'ولا بدّ لنا من عداد ذلك القياس في اعمال العرب العلمية المجدة المأثورة'

These measurements having been taken between the latitudes 35 and 36 where the real length of the arc is 111,306 metres, the difference is 877 metres in excess of the true value which amounts to less than half of an English mile The whole circumference according to Nallino would exceed 150 miles

We, however, owe to Al-Bîrûnî the measurements of these results in the Arabian Zira' and have calculated them in the English feet as in the following —

One degree	= 226,666⅔ Zira or 366,802¼ feet
Circumference	= 81,600,000 or 25,009$\frac{2}{7}$ miles
Diameter	= 12,979,500 Zira' or 3,978,044 feet

The real circumference of the Earth being 24,858 miles, the difference amounts to 151 miles, or nearly the same as Nallino's calculations

But as we have already pointed out above it was a compromise value accepted by the astronomers as a mean taken between the two divergent measurements of Al-Mâmûn's times

According to our researches the best result was obtained by the actual measurements in the plains of Sinjâr, where, according to Habash (as narrated by Ibn i-Yûnus in his Zij) the astronomers had found the value of one degree as 56¼ miles

According to this measurement the value of the degree would be as in the following —

56¼ Arabian miles,
or 225,000 Zira',
or 364,106¼ English feet

Circumference

= 81,600,000 Zira',
or 24,825$\frac{3}{7}$ miles

[1] Lectures, p 289 —

" امّا قياس العرب (يعني 'المأموني') فهو اول قياس حقيقي، اجرى كله مباشرة مع كل ما اقتضته تلك المساحة من المدّة الطويلة و الصعوبة و المشقّة و اشتراك جماعة من الفلكيين و المسّاحين في العمل " .

Now the latitude of Sinjâr as given in Al-Bîrûnî's Al-Qânûn is 35° 50′ ([1] or 30′), where the value of the arc is about 364,150 feet, and as compared with the Arabian measurement it exceeds it by about 44 feet only

As to the circumference, it differs by about 33¾ miles only, and if the Earth were a perfect globe and not a geoid, the difference would not exceed 3 miles in the whole of the Earth's circumference!

These results are thus wonderfully close to the correct values, and deserve to rank as the best of those obtained before the modern times

We do not propose to deal in detail with the other values, also ascribed to Al-Mâmûn's times, i e , 56 miles and 57 miles for the degree, as obviously they are not so accurate as the previous ones, the former being much shorter and the latter much longer than the true lengths of the arc

Now let us take up Al-Bîrûnî's own measurements as given in Al-Qânûn —

1 degree	= 224,389 Zira' or 56° 0′ 50″ 6‴ or 363,115 English feet
Circumference	= 80,780,039 Zira' or 24,778½ English miles
Radius	= 12,851,370 Zira' or 3,939 miles
Diameter	= 7,878 miles

Al-Bîrûnî's site of measurement being the fort of Nandnâ, which according to Al Qânûn had a latitude of 34° 10′, the length of the arc, therefore, would come to about 364,150 feet, a value which exceeds that of Al-Bîrûnî's by 1,035 feet or a little more than ⅕ of a mile only

Al-Bîrûnî's circumference is some 80 miles less than the true circumference, but if we take the Earth a perfect globe then the difference is about 70½ miles only

Modern Geodesy has measured the radius of the Earth at the equator as about 6,378 kilometres, one kilometre being equal to 0·621 English miles, the radius comes to about 3,951 English miles and differs from Al-Bîrûnî's calculations by about 12 English miles only

As already rightly observed by Nallino (p 290 of his Lectures), one of the impediments in ascertaining the precise value by means of this method would be the Refraction of the Ray of Light while passing through the air, and therefore, whatever little difference

[1] Page 37 of Bîrûnî's Picture of the World —

سحار ق برا به رصد المامون دور الارض له، ل (اول)

exists in Al-Birûni's results must also be very much due to the same reason [1]

But before we take leave of Al-Birûni's measurement we have still to account for the different values as assigned by Al-Biruni himself in his 'Tahdid' and 'Al-Qânûn' to his own measurement of the Earth's diameter at Nandnâ In 'Tahdid' the value of the degree is given as a little less than 56 Arabian miles, while in Al-Qânûn a little more than 56 miles [2]

The only possible explanation to our mind seems to be that Al-Birûni had kept with himself the data of his observations at Nandnâ, and, as the subject continued to retain his interest to the end, he revised his previous calculations, and has embodied his better estimations As his previous calculations are obviously less exact they need no further discussion

No subsequent Muslim researches on the subject can be compared favourably with the researches of these greatest astronomers, who belonged to the Golden Age of the Islamic Culture and learning; when the scientific interest in all the various branches of knowledge had reached its climax and produced in all fields wonderful results indeed at the hands of those great Muslim scholars who were the best of their times in every line, and some of them like, Al Birûni, worthy of standing in company with the best of all times and nations in the world's history

Appendix I

Nallino's exposition of Al-Birûni's trigonometrical method for ascertaining the radius of the Earth as described by him in his book on the Astrolabe, and later on tested at Nandanâ in India —

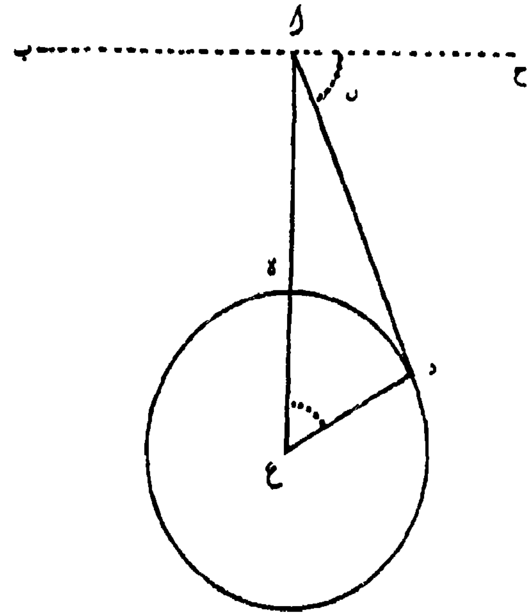
هذا كلام البيروني ولا يصعب البرهان عليه لنفرض (شكل ١) نقطة آ قمة جبل ما وخط آه عموده اي ارتفاعه وهو خط يصل امتداده الى نقطة ع التي هي مركز الارض ـ ثم نرسم خط ب ج عموداً على آع موازياً لافق قمة الجبل ، ونرسم ايضاً

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[1] و من الموانع ايضاً كثرة انكسار الضوء (refraction) التي تمنع عن قياس زاوية الانحطاط بالضبط ، ومن المعلوم ان الانكسار اكثر قدره في مستوى الافق واقله (بل عدمه) في خط سمت الرأس ، اي في ٩٠° من الارتفاع عن الافق (ص ٢٩٠)

[2] Tahdid 55° 58′ 55″
Al Qânûn 56° 0′ 50″ 6‴

خط ا د المماس لمحيط الدائرة على نقطة د ـ و حيث ان يبرهن فى الهندسة (1) انّ الخطّ المستقيم المماسّ لدائره ما عمود على نصف القطر الواصل الى نقطته التماسّ يكون ا د



شكل ١١

عموداً على ع د و مثلث ا د ع يكون قائم الزاوية على نقطه د ـ امّا زاوية ح ا د فهى ما نسمّيه البيرونى انحطاط الافق، و من الواضح انّها تمام زاوية ع ا د انّها تعادل زاوية ا ع د ـ فاذا اشرنا بحرف ن الى نصف القطر المسوة الخطوط المساحيّة انه و بحرف ر الى نصف قطر الارض و بحرف ف الى ارتفاع الجبل و بحرف ن الى الانحطاط ينتج من قواعد حساب المثلّثات المستوية:

حا ع ا د = حاح ا د = حان = نق (د ع / ا ع) = ن (ر / (ر + ف))

ن ر = حان (ر + ف) = ر حان + ف حان

ن ر ــ ر حان = ف حان   ر (ن ــ حان) = ف حان

فينتج   ر = ف حان / (ن ــ حان)

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1 كتاب تحرير اصول اوقليدس من تاليف خواجه نصير الطّوسى المطبوع فى رومه سنه ١٥٩٤ م، ص ٧٧ (الشكل السابع عشر من المقاله الثالثه).

و هذا المعادلة الاخيرة هى قاعده البيرونى، لانّ الجيب المكوس عبارة

عن نصف القطر المنقوص منه جيب تمام الزاوية المفروضة ـ فان ضربنا ر ى ط اى ى ٢٢/٧

كان الحاصل مقدار محيط الارض (ص ۲۹۱ — ۲۹۲ علم الفلك تاريخه عند العرب) *

APPENDIX II

A short note on the Arabian unit of measurement 'Al Zira'-ul-Sauda' (الذراع السودا) used by Al-Mâmûn's astronomers and also by Al-Birûni in determining the Earth's diameter

Imâm Abul Hasan Ali b Mohammed b Habib-ul-Basari-ul-Baghdâdi, well known as Imâm Al-Mâwardi (†450 A H, 1058 A D), in his famous book *Al-Ahkâm-ul-Sultâniah* (الاحكام السلطانيه) has given a very interesting account of the various zira' (cubits) in vogue amongst the Muslims of his times Of the seven kinds enumerated by him 'Al-Sauda' stands third in length being longer than two others and shorter than the remaining four According to him this cubit was first invented by Hârun-ul-Rashid, taking the length of his black slave's arm for its measure This cubit was used in measuring cloths, houses, etc The name is obviously derived from Al Sauda, the black, being the description of the Negro slave of the Caliph [1]

On the other hand, Al-Masûdi in his *Kitâb-ul-Tanbih-wa'l-Ishrâf* (كتاب التنبيه و الاشراف) (355 A H, $\frac{395}{397}$ A D) says that this cubit was invented by Al-Mâmun for measuring cloth, houses, and the division of the travelling stages According to him the cubit consisted of 24 fingers The finger was equal to 6 barley grains placed side by side of one another Three miles made a farsakh [2]

The latest discussion on this subject has been undertaken by the learned writer of *Jâma-i-Bahâdur Khâni*, an encyclopaedia of mathematical and astronomical sciences According to him (p 337) the followers of the Greek writers took the thickness of 6 ordinary hairs of the horse's mane for determining the width of an ordinary

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1 الاحكام السلطانيه ص ۲۳۹ ۲۵۱ (مطبوعه جامعه عثمانيه ـ ۱۹۳۱ع) ·

2 و الميل اربعه آلاف ذراع بالسوداً و هو الذراع الذى وضعه المامون لذرع الثياب و مساحة البناء و قسمة المنازل، و الذراع اربع و عشرون اصبعا . و الاصبع ستّ شعيرات مضموم بعضها الى بعض و الفرسخ بهذا الميل ثلثه اميال (ص ۲٦ - ۲٧) ·

barley seed, and 6 barley seed for the width of a finger Twenty-four fingers for a cubit or zira', while the European scientists have employed the width of 8 ordinary barley seeds for determining the length of an inch According to this a cubit or zira' would be equal to $1\frac{1}{2}$ feet,[1] which is only very roughly correct as Nallino's more exacting researches have established that the length of Zirâ' ul-Sauda was considerably more than $1\frac{1}{2}$ feet, 4,000 zira' being equal to 6,473 feet We do not propose to enter into the discussion about the other Arabian zira' (cubits) as they are not strictly pertinent to our present study Those interested may refer to Al-Mâwardi for the comparative lengths, Ibn-i-Rustâh's کتاب الاعلاق النفیسه, p 29, Yâqût's *Geographical Encyclopaedia*, Vol I, pp 25-26, Egyptian edition, and Al-Masûdi's *Kitâb ul Tanbih*, p 38, for further details of other systems prevalent in those times

APPENDIX III

To the best of our knowledge the solution of Al-Birûni's trigonometrical problem, according to the data and method employed by him, and fully detailed in *Al Qânûn*, has not so far been attempted and tested by means of actual calculations We are much indebted to the collaboration of Mr S M Abul Kâzim, M A, Lecturer of Mathematics, Muslim University, Aligarh, a prominent young scholar of real merits, in our fixing the pertinent part of the actual text and its translation as well as working out in detail all the steps involved in it

For the text we had the advantage of having a copy from the most precious manuscript of the year 562 A H (1166-1167 A D), once in the custody of the Lytton Library, Muslim University, Aligarh, and now in Berlin (It is fully described in my *Al-Birûni*, 2nd edition, 1927, pp 136-138) For further comparison we had a more recent copy of a manuscript, once owned by the late Syed Mahmûd, son of Sir Syed Ahmad Khân, and now possessed by the Muslim University, Aligarh, and also a third copy of the Râmpur State Library, a true transcript of the chapter relating to the subject from it having been recently supplied to us by Mr Arshi, the

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[1] (ذکر مقیاس مساحت مقرره) ۔

. . مقدار یونان مقدار ده موی یال اسپ که در باریکی و کلفتی متوسط باشد و بعضی به بعضی به پیچیده عرض یک جو معادل می‌شود، و شش جو را یک اصبع، و دوازده اصبع را یک وجب، و دو وجب را یک ذراع و دو ذراع را یک گز و دو هزار گز را یک میل، و سه میل را یک فرسنگ همی شود ۔

اما مقیاس فرنگ مقدار هشت جو متوسط را یک انچ گویند، و دوازده انچ یک فت، و سه فت را یک گز انگریزی و پنج گز را یک لٹھ انگریزی می‌شود، . . ص ۳۳۷ ۔

librarian, who, for the sake of accuracy, took the trouble of copying it out in his own hand We are much obliged for his prompt reply and kindness The last manuscript is dated 1035 A H (1625 A D), and judging from the account given by the learned librarian, as well as from the faithful transcript supplied to us, it appears to be full of blunders, and is a very inaccurate copy of the book indeed But even it has been of use in clarifying one or two dubious figures

It would be of no good to go into the lengthy details relating to the various corrections that were necessary to be made in fixing Al-Biruni's own text After having gone through all the calculations we are now satisfied that the text as presented to the readers is finally established, and for all our purposes is thoroughly reliable

Now to the problem itself —

حس تمام الانحطاط

= sin ا ه ط = sin 89° 26'

$$= 0^P, 59', 59'', 49''', 2''''$$

$$= 0+\frac{59}{60}+\frac{59}{3600}+\frac{49}{216000}+\frac{2}{12960000}$$

$$= 9833333333$$
$$+ 0163888888$$
$$+ 0002268518$$
$$+ 0000001543$$

$$= 999949228$$ (correct to 9 decimal places only)

حس كل = sin 90° = 1

وصل = هج

$$= 1-\sin 89° 26'$$

$$= 1-0^P, 59', 59'' 49''' 2''''$$

$$= 0^P, 0', 0'', 10''', 57'''', 32'''''$$

$$= \frac{10}{216000}+\frac{57}{12960000}+\frac{32}{777600000}$$

$$= 000046296\text{29}$$
$$+ 0000043915$$
$$+ 0000000411$$

$$= 000050735$$ (correct to 9 decimal places only)

هج cubits = $652\frac{1}{20}$ cubits $= \frac{13041}{20}$ cubits

Now $\frac{\text{هج}}{\text{ط}}$ cubits = $\frac{\text{excess هج}}{\text{half chord ط}}$ or $\frac{\frac{13041}{20}}{\text{ط cubits}} = \frac{000050735}{999949228}$

i.e ط the radius of the Earth in cubits $= \frac{13041}{20}\times\frac{999949228}{000050735}$

$$= \frac{6520168941174}{507350}$$

$$= 12851421 \text{ cubits}$$

As compared with Al-Birûni's calculation of the radius of the Earth, i e. 12851369 cubits, our result is only 52 cubits in excess But if we substitute in the above calculations 507352 instead of 507350 as the divisor, we get almost the same results as Al-Birûni had reached in calculating the radius of the Earth In any case on the given data his result stands most approximately tested, and verifies the various values assigned in the text

We have not deemed it necessary to go beyond the sine values as given by Al-Birûni himself. In our research for verification we have tried to ascertain these values from other sources as well For instance, by consulting the well-known mathematical encyclopaedia *Jâma-i-Bahâdur Khâni* (جامع بهادر خانی) we found the sine values for the angle of 89° 26′ as 0^P, 59′, 59″, 49‴, 26⁗, 9′′′′′, 26′′′′′′ (نط نط مط كو ط كو)[1] which correspond with Al-Birûni's own value up to the thirds only Similarly the sine value of 34′ is 0′, 35″, 36‴, 14⁗, 54′′′′′, (له لويد ند),[2] which again corresponds with Al-Birûni's values up to the thirds only

The learned author of *Jâma-i-Bahâdur Khâni* has claimed that he had derived his tables from the Muslim astronomers, naming Al-Birûni, Khwâjâ Nasiruddin Tûsi and Ghiyasuddin Jamshed (contemporary of Ulugh Beg), whom he especially mentions as the real pioneers in the field of this trigonometrical method [3]

It is apparent that he has depended for his values on subsequent writers We have strictly confined ourselves to the values as given by Al-Birûni himself We leave it to others to see if in the light of better knowledge the result could be still improved upon [4]

The word 'jaib' (جيب) is derived from the Sanskrit word 'jiva' The Arab astronomers borrowed it from the Hindus, at first

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[1] Page 383 [2] Page 350

[3] ص ۲۱ اما ماهران چون ابو ریحان بیرونی و خواجه نصیر الدین طوسی و غیاث الدین جمشید و غیرهم رحمهم الله ... همان اعمال را بر حسب میدارند

[4] Fortunately Al Qanûn's Third Miqâlâ (مقاله) has very ably been translated with copious notes into German language by Von Schoy at Hanover 1927 On p 37 of it are given the tables of values for the series of the various angles as given by Al-Birûni himself We have tallied these values and find them to correspond with Al Birûni's values in this problem

In the end of Von Schoy's work is appended another table extracted from Ulugh Beg

For those interested in further researches in the subject it would be extremely interesting to repeat Al-Birûni s labours on the very site in Pakistan where he himself for the first time carried them out so successfully

writing it as 'jib' Later on they imagined that it resembled their own word 'jaib', although there is no connection between the two [1]

In India chords were halved and became known as 'jivas' (sines) which are found mentioned in the writings of Aryyâbhâtta (*c* A D 500) and Brahmagupta (*c* A D 620) When the Arabs became acquainted with the astronomical works of the Hindus the use of the sines as known to the Hindus passed to their keeping They developed the sine theorem, and employed it, wherever possible, by the middle of the fourth century A H [2] According to Nasiruddin Al-Tûsi[3] (†672 A H , 1274 A D) the discovery of the sine theory as applied first to the right-angled triangles was simultaneously claimed by several Muslim astronomers Al-Birûni, in his book, 'The Key to the Science of Astronomy' (مقاليد علم هيات) had collected the various methods employed by these astronomers He asserted that his teacher Abû Nasr Mansûr b Ali b Irâq was the first scholar who described the sine theory in trigonometry Suter has published in the German language the translation of his

الرساله ابى نصر بن عراق فى برهان تناسب جيوب الاضلاع لجيوب الزوايا المقابله

from a manuscript in the Leyden Library (1910)

Other rivals to the claim were Abul Wafâ Mohammed b. Mohammed al-Bûzjâni (†388 A H , 998 A D) and Abu Mahmûd Hâmid b Al Khizr-al-Khujandi (later half of the fourth century A H) [4]

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[1] Nallino, pp 168-169

[2] *Encyclopaedia Britannica*, 14th edition, Vol XXII, p 470

[3] كتاب الشكل القطاع المطبوع فى القسطنطنيه سنه ١٣٠٩ - ص ١٨

[4] See Nallino, pp 244-245 On account of its significance I quote the whole passage here below —

و مما يستحق الذكر ان العرب توصلوا فى النصف الثانى من القرن الرابع الى اثبات تناسب جيوب الاضلاع لجيوب الزوايا المقابلة لها فى اى مثلث كروى، بل وضعوا هذه القاعدة اساساً للطريقة التى سموها "الشكل المغنى" فى حل المثلثات الكروية ، قال نصير الدين الطوسى(١) المتوفى سنة ٦٧٢/١٢٧٤ "اصل دعاويه(٢) ان نسب جيوب اضلاع المثلثات الحادثة من تقاطع القسى العظام فى سطح الكرة كنسب جيوب الزوايا الموترة بها، و قد عرف العلة بيان هذا الدعوى اولاً فى المثلث القائم الزاوية، و قد ذهبوا فى اقامة البرهان عليها مذاهب جمعها الاستاد ابو الريحان البيرونى(٣) فى كتاب له سماه مقاليد علم هيات ما يحدث فى بسيط الكرة و غيره، و يوجد فى بعض تلك الطرق تفاوت، فاخترت منها ما كان ا د مابية، لكون هذا الكتاب جامعاً مع رعاية شرط الايجاز، و ابتدأت بطريق الامير ابى نصر على بن عراق(٤)، قال القائل على ظن ابى الريحان انه السابق الى الظفر باستعمال هذا القانون فى جميع المواضع، و ان كان كل واحد من الفاضلين ابى الوفا محمد بن محمد البوزجانى(٥) و ابى محمود حامد بن الخضر الخجندى(٦) ادعى السبق ايضاً فيه(٧) ".

Al-Bırûnı has made full use of the sine theory in *Al-Qânûn*, and other works It is claimed that the determination of the sine of one degree theoretically is primarily the work of Al-Bırûnı In subsequent times Ulugh Beg and Ghayâsuddın Jamshed claimed themselves to be the discoverers But it has rightly been contended that they got it from Al-Bırûnı's *Al-Qânûn* which was so often in their use [1]

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(١) كتاب الشكل القطاع المطبوع فى القسطنطينية سنة ٩ ١٣ ص ١٠٨ ٭

(٢) اى دعاوى الشكل المغنى ٭

(٣) توفى سنة ٤٤٠هـ = ١٠٤٨م ٭

(٤) هكذا فى الطبعة و الصواب ابو نصر منصور بن على بن عراق، كان هذا الرياضى الشهير استاذ ابى الريحان البيرونى، و لعلّه ادرك الاربعمائة للهجرة، راجع H Suter, Die Mathematiker und Astronomen der Araber und ihre Werke, Leipzig, 1900, pp 81–8, 213, 225

(٥) توفى سنه ٣٨٨هـ = ٩٩٨م ٭

(٦) ربما فى النصف الثانى من القرن الرابع ٭

(٧) و نشر حديثاً سوتر ترجمة المانية الرسالة ابى نصر بن عراق فى برهان تناسب جيوب الاضلاع لجيوب الزوايا المقابلة لها بناءً على نسخه من الرسالة موجودة فى مكتبة لندن H Suter, Zur Trignometrie der Araber (Bibliotheca Mathematica herausgegeben Von G Enestrom, 3 Folge, X Bd, 1910, 156–160)

[1] For a full discussion of the topic, please see the interesting account in Deh Khudâ's *Life of Al Bırûnı*, pp 13-15, from which the following has been extracted —

وهم از طرايف آثار و مسائل نفيسه كه (البيرونى) خود در آنها ابتكار كرده است استخراج جيب درجه واحده است كه در قانون مسعودى بيان كرده سلطان شهيد الغ بيگ در زيج خود استخراج جيب درجهٔ واحده را بطريق برهانى بخود منسوب و مخصوص داشته است، چنانچه در باب دوم از مقاله دوم در معرفت اوقات و طالع هر وقت و آنچه تعلق بدان دارد گويد ''جيب يك درجه را كه بناء عمل جدول جيب و ظل بر آنست الى يومنا هذا هيچ كس بطريق برهان استخراج نه كرده، همهٔ حكما تصريح كرده اند با آنكه طريق عمل باستخراج آن ساخته اند و حيلت كرده اند تا بتقريب بدست آورند و ما بعنايت الله و منّه بطريق برهان ملهم شديم و در بيان آن عليحده كتابى پرداختيم و ملا عبد العلى بيرجندى در شرح زيج گويد قدما جيب يكدرجه را بتقريب بيرون آوردند و بناء جدول جيب بر آن نهاده اند و افضل المهندسين مولانا غياث الدين جمشيد كاشانى كه اصل رصد سمرقند از آثار طبع لطيف اوست ملهم شده باستخراج جيب يكدرجه و در آن باب رسالهٔ انشاء نمود و مصنف نعمده الله بغفرانه طريق ديگر در باب جيب درجهٔ واحده بيان فرموده و در آن رساله نوشته است''. انتهى ٭

مصنف و شارح حق ابو ريحان را كتمان كرده اند چه كتاب قانون مسعودى در خزائن كتب سلطان شهيد بوده است و در اكثر اوقات بمطالعهٔ آن فائز مى‌شده كاش سلطان شهيد در مسئلهٔ جيب درجه واحده از استنباط و استفادت خود عارى مى‌گفت يا در افادت و افادت ابو ريحان اشارتى مى‌كرد و نيز ملا عبد العلى بيرجندى .. كلامى از ابو ريحان مى‌گفت يا نامى از او ذكر مى‌كرد .... ٭

Later on the systemizer Nasiruddin Al-Tûsi collected and supplemented the labours of his predecessors, and organized the knowledge into a coherent whole Lacking the co-sine theorem Al-Birûni and Al-Tûsi resorted, when necessary, to auxiliary right angles to solve problems in oblique triangles [1]

Thus in determining the dimensions of the Earth Al-Birûni not only employed his novel method, but also resorted to the use of sines, in the theoretical development and practical application of which he stands out as one of the foremost pioneers in history

Appendix IV

(i) Details of our own calculations in English miles and feet of the measurements made by the astronomers of Al-Mâmûn and Al-Birûni

According to Nallino $56\frac{2}{3}$ Arabian miles measured 111,815 metres, while the real length of the arc of Meridian between 35° and 36° is 110,938 metres

The difference of 877 metres is equal to 2,347 feet which is less than $\frac{5}{11}$ mile The calculations are as follows —

Metres	Metres	Feet	Feet
1973	877	5280	x

$$x = \frac{877 \times 5280}{1973} \text{ feet}$$

$$\text{or } x = \frac{4630560}{1973} \text{ feet}$$

$$= 2347\tfrac{29}{1973} \text{ feet}$$

$$= \frac{2347}{5280} \text{ mile}$$

$$= \text{less than } \tfrac{5}{11} \text{ mile}$$

(ii) According to Al-Birûni Al-Mâmûn's one degree of $56\frac{2}{3}$ miles had $22666\frac{2}{3}$ zira' (which are to be changed into English feet in the following way) —

Zira'	Zira'	Feet	Feet
4000	$22666\frac{2}{3}$	6473	x

$$x = \frac{22666\frac{2}{3} \times 6473}{4000}$$

$$= 366802 \text{ feet}$$

[1] *Encyclopaedia Britannica*, Vol XXII, p 467

And the circumference of the Earth is 81,600,000 **zira'** which is equal to 81600000 − 4000 feet

$$= \frac{528196800000}{4000} \text{ feet}$$

$$= 132049200 \text{ feet}$$

$$= 25009\ 31 \text{ miles}$$

The modern measurement of the Earth's circumference is 24,585 miles, therefore the difference between the modern and Al-Mâmûn's measurements is equal to 25009 − 24858 = 151 miles

(iii) According to Habash in *Ibn-i-Yûnus* one degree is equal to 56¼ Arabian miles which are equal to 56¼ × 4000 zira'

$$= 225000 \text{ zira'}$$

$$= 225000 - \frac{4000}{6473} \text{ feet}$$

$$= \frac{225000 \times 6473}{4000} \text{ feet}$$

$$= \frac{1456425000}{4000} \text{ feet}$$

$$= 364106\tfrac{1}{4} \text{ feet}$$

The modern measurements for one degree is 364,150 feet, therefore the difference between the modern and Al-Mâmûn's measurements (for one degree) is equal to 364150 − 364100 = 44 feet

Therefore, according to Habash the measurement of the whole circumference of the Earth will be

$$36106\tfrac{1}{4} \times 360 \text{ feet}$$

$$= 131078250 \text{ feet}$$

$$= \frac{131078250}{5280} \text{ miles}$$

$$= 24825\tfrac{445}{528} \text{ miles}$$

Thus the difference between the modern measurements and Al-Mâmûn's measurements of the circumference of the Earth will be 24858 − 24825 = 33 miles

But if the Earth were a complete globe instead of being an oblate spheroid, the difference between the modern and Al-Mâmûn's measurements would have been 3 miles only [1]

[1] The calculations are simple —

$$44\text{ft} \times 360 = 15840 \text{ ft} = \frac{15840}{5280} \text{ miles} = 3 \text{ miles}$$

(iv) According to Al-Birûni the Earth's radius is more than 12,851,369 zira', i e

$$\frac{12851369 \times 6473}{4000} \text{ feet}$$

$$= \frac{12851369 \times 6473}{4000 \times 5280} \text{ miles}$$

$$= 3938{\cdot}774 \text{ miles}$$

The difference between the modern measurements and Al-Birûni's measurements of the Earth's radius is equal to

$$3959{\cdot}738 - 3938{\cdot}774 = 11\,964 \text{ miles}$$

Al-Birûni's arc being about 224,389 zira' or 363,115 feet, with a difference of 1,035 feet, the whole difference in the circumference, if the Earth were a complete globe, would be 70 568 miles only [1]

[1] The calculation is as follows —

$$1035 \text{ ft} \times 360 = 372{,}600 \text{ ft} = \frac{372{,}600}{5280} \text{ miles} = 70\,568 \text{ miles}$$

L'INDIA VISTA DA DUE GRANDI PERSONALITA' MUSULMANE BĀBAR E BĪRŪNĪ

Per

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Nella sua introduzione alla traduzione delle *Āṯār al-Bāqiya* di al-Bīrūnī, il Sachau osserva 'Authors of the first centuries of the Hijra sometimes betray a great deal of commonsense *Then* the author entirely disappears behind his book, all literary work sinks down to the level of imbecile compilation from good and bad sources' [1] Anche se questo é in parte vero—specialmente per quanto riguarda gli scritti di filosofi, teologi, ecc —nessuno potrà negare la personalità e la vividezza di alcune opere anche relativamente tarde, di musulmani viaggiatori e guerrieri, quali ad es Ibn Battūta e Bābar, fino a certe vivacissime relazioni di ambasciatori persiani del secolo passato Nella loro forte personalità e nella mancanza di quel tardo e cieco senso di *taqlīd* di certi autori orientali (e perché no, anche occidentali) Bīrūnī e Bābar hanno qualcosa di comune

Ecco una prima giustificazione di questo paragone, forse un po' strano, fra due personalità divise da circa mezzo millennio di distanza, di razze diverse, legati solo dalla grande forza unificatrice dell'Islam e dal fatto di aver visitato una stessa terra straniera Il carattere di queste righe vuol essere dunque non filologico, ma psicologico può forse contribuire anche a dissipare quel pregiudizio, abbastanza diffuso in Occidente, che gli Orientali e nella fattispecie i musulmani 'siano tutti eguali', si somiglino tutti [2]

Innanzitutto una osservazione preliminare l'India che vide al-Bīrūnī e quella che vide Bābar non sono che in parte la stessa India geograficamente, storicamente e dal punto di vista sotto il quale essi la studiano Geograficamente Bābar viaggiò come é noto più di al-Bīrūnī nell'India Le zone che Bīrūnī può aver conosciuto direttamente non sembra che oltrepassino il Panjab,[3] mentre Bābar giunse ad oriente fino al Bihār Storicamente, come dicevamo, si tratta di ben 500 anni circa di differenza l'India di Bābar è

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[1] *The Chronology of Ancient Nations* translated and edited with notes and index by EDWARD SACHAU London, 1879, pag X

[2] Per l'interesse che può offrire la 'comparazione nello studio delle culture orientali v RUBEN *Ueber philosophievergleichende Literatur*, in OLZ, 1931, 96 segg

[3] Sulle regioni dell' India visitate da al-Bīrūnī v S H. BARNI *Al Bīrūnī* Aligarh, Muslim University Press, 1346 H (1927) Pag 88-89 (in Urdu)

molto piú islamizzata di quella di al-Bīrūnī e cambiamenti radicali avvengono pur anche in quei paesi dove la storia é considerata un meccanico e uniforme *gardiš-i falak* Infine mentre l'oggetto che piú interessa Bīrūnī sono le teorie filosofico-scientifiche e religiose degli Indiani, Bābar apre i suoi vivaci occhi specialmente sulla natura e sulle cose esteriori del paese che visita

A guisa di introduzione osserviamo un po' come Bābar e Bīrūnī descrivono una identico oggetto, per esempio il rinoceronte [1]

Bīrūnī I—203, 99

Il *ganda* é molto numeroso in India, specialmente attorno al Gange Ha la forma di un bufalo, ha una pelle nera a scaglie, e giogaie sotto il collo ha tre zoccoli in ogni zampa, gialli, uno grande davanti e gli altri due dai lati La coda non l'ha lunga e gli occhi sono molto piú bassi del solito sulle guance Sul naso ha un unico corno curvato all'insú I bramini hanno il privilegio di mangiare la carne del *ganda* Io stesso ho visto coi miei occhi un giovane *ganda* che colpí un elefante che lo aveva assalito lo colpí nella zampa anteriore col corno e lo abbatté

Io pensavo che il ganda fosse il *karkadann* (rinoceronte), ma poi un tale venuto da Sofāla nel paese dei *Zanǧ* mi comunicò che il *kark* il cui corno si usa per i manichi dei pugnali qui da noi é simile a questo [2] e si chiama nalla lingua dei zanǧ *impīlā* E'di vari colori e ha sul cranio un corno conico largo alla base ma non molto alto Il fusto del corno é nero all'interno e per il resto bianco Sulla fronte ha poi un altro corno piú lungo simile al primo che si rizza al momento dell'azione quando l'animale vuol dare cornate Il rinoceronte lo affila sulle rocce finché diviene tagliente e aguzzo Ha degli zoccoli e una coda come quella dell'asino

Bābar 489, 275*b*

Un altro é il rinoceronte Anche questo é un grosso animale, pari in grandezza a tre bufali (*gāwmīš*) Nei nostri paesi (*ol wilāyatlar*) é cosa risaputa che esso può sollevare un elefante sul suo corno, ma questo e probabilmente un errore

[1] Per le citazioni uso per Bābar la traduzione inglese di A S Beveridge, tenendo presente il testo turki del mss di Hyderabad pubblicato dalla medesima nel Gibb Memorial (v I, 1905), per Bīrūnī la classica edizione e traduzione del Sachau Il primo dei numeri indica la pag della traduzione il secondo quella del testo

[2] Il testo ha *qarīb min hadih al-ṣifa*, quindi meglio 'simile a questo', piuttosto che 'comes *nearer* this description' come traduce il Sachau Il concetto é 'credevo che il rinoceronte unico e vero fosse il *ganda* ma poi uno mi disse che c'é un altro animale *l'impila*, vicino a quello' Non dice, né potrebbe dirlo date le notevoli differenze, (due corni invece di uno ecc) che é *piu simile l'impila*

Ha sul naso un corno, lungo piú di nove *qārīš*[1] con corni di due *qārīš* non se ne vedono Con un solo grosso corno ne fecero un vaso da bere (*āb-ḫwura kišti*), una scatola pel gioco del *nard* e rimase ancora uno spessore di tre o quattro dita[2] La corazza del rinoceronte é molto spessa, una freccia che parte da un arco teso, lanciata a tutta forza, se riesce a traforare può penetrare a quattro *elik* Dai lati delle sue zampe anteriori e posteriori pendono delle pieghe che a distanza sembrano una gualdrappa che lo ricopra Assomiglia al cavallo piú che altri animali Ha pancia piccola come il cavallo, come nel cavallo un solo osso cresce al posto di piccoli ossicini, come c'é nella mano (elik) del cavallo una tibia cosí anche nel rinoceronte E' piú feroce che l'elefante e non può essere addomesticato. Nelle foreste di Parašāwar e Hašnagar ce ne sono grandi quantità ed anche fra il-fiume Sind e le foreste del paese di Bhira Gran numero ce n'é anche sulle rive del fiume Saru nell'Hindustan Alcuni ne furono uccisi, nelle nostre spedizioni in India, appunto nelle foreste di Parašāwar e Hašnagar Colpisce violentemente col suo corno, in quelle cacce parecchi uomini e cavalli furono colpiti da cornate In una di esse il cavallo di un soldato di nome Maqṣūd fu lanciato alla distanza di una lunghezza di lancia, per la qual cosa quell'uomo ricevette il soprannome di 'oggetto del rinoceronte' (*maqṣūd-i karg*)

Le osservazioni seguenti si possono facilmente dedurre da questa prima comparazione In primo luogo Bābar delimita con piú esattezza e precisione le località abitate da rinoceronti, quasi tutte visitate personalmente Bīrūnī afferma su informazione d'altri, che l'animale abbonda nelle regioni del Gange, trascurando in un piú ampio volo d'uccello i fatti particolari Anche la descrizione esterna dell'animale é piú generica in Bīrūnī, mentre Bābar giunge fino all'anatomia, pero mentre Bīrūnī dà una idea complessiva molto chiara dell'animale Bābar si perde un po' piú nei particolari

Mentre Bīrūnī compara da scienziato piú teorico che sperimentatore il *ganda* all africano *impīla*, anche per stabilire una precisazione lessicale e linguistica, Bābar entra nella curiosa, e non ben chiara, comparazione anatomica col cavallo Infine la descrizione bābariana é pratico-dinamica il corno del rinoceronte gli rammenta il vaso da bere, lo spessore della pelle trova la sua espressione nella descrizione di una frecciata Quella di Bīrūnī é piu scientifico-statica anche l'accenno ai manici dei pugnali fatti col corno del *l'impīlā* è data come notizia spersonalizzata, fornitagli da un informatore

Puo essere interessante dopo queste due descrizioni del rinoceronte leggere quella che dello stesso animale (anche da lui

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[1] Misura variabile simile al pollice (*inch*) inglese

[2] *elik*, altra misura non uniforme Il pers traduce *angušt* dito

chiamato senza troppi scrupoli lessicali *karkadann*) fa Ibn Battūta[1] (Mžik 28-29) La descrizione di Ibn Battūta é piú giornalisticamente esagerata che immaginosa E' colpito dalla grossezzza della testa dell'animale e giunge ad affermare 'esso é piú piccolo dell'elefante ma la sua testa é parecchie volte(!) piú grande che la testa dell'elefante' Anche le misure sembrano alquanto esagerate La grossa testa del rinoceronte ritorna poi insistente alcune righe dopo Si potrebbe dire che se Bīrūnī é lo scienziato teorico e un po' libresco e Bābar il pratico e lo sperimentatore, Ibn Battūta é il reporter curioso, l'artista viaggiatore

Ancora sulla natura fisica dell'India Ambedue gli autori offrono qualche descrizione geofisica interessante e comparabile Per esempio

Bīrūnī I—198, 97

Ma se, osservandolo di persona, considerate il suolo dell' India e le pietre arrotondate che si trovano fin dove potete scavare sotterra, pietre piú grosse presso le montagne e dove é piú forte la corrente dei fiumi, piú piccole man mano che ci si allontana dalle montagne e si indebolisce la forza della corrente, pietre che appaiono polverizzate in forma di sabbia là dove le correnti stagnano vicino alle foci dei fiumi e al mare non potete fare a meno di immaginare la terra dell'India come un antico mare man mano riempito dalle materie alluvionali portate dalle correnti

Bābar 485, 273

Un' altra catena montuosa dell'India[2] corre da nord a sud Comincia nel paese di Delhi da una piccola collina rocciosa dove c'é la residenza di Fīrūz-Šāh e proseguendo di lí appare presso Delhi in forma di colline rocciose staccate molto basse sparse qua e là Oltre Mīwāt entra nel paese di Biāna Le colline di Gwālior, sebbene non connesse con questa catena, sono dei contrafforti di essa, come anche le colline di Rantanbōr, Čitōr, Čandērī e Mandāu Distano in qualche punto dalla catena principale 7 od 8 *kuroh* Queste colline sono molto basse, scabrose, rocciose e boscose Non vi cade neve ed esse danno origine a vari fiumi

La descrizione di Bābar é degna di un viaggiatore moderno e tanto piú acuta ci appare la sua interpretazione geofisica se pensiamo che non aveva come noi a disposizione carte o altri simili

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[1] Hans von Mžik *Die Reise des Arabers Ibn Baṭūṭa durch Indien u. China*, Hamburg 1911, pag 28-29 Per il testo si veda la nota ediz del Defrémery e Sanguinetti, v III, p 100

[2] I monti Aravalli, chiamati appunto Apocopi, 'gli spezzati' anche da Tolomeo

mezzi di studio per riconoscere l'unità di un antico sistema orografico così frantumato L'Enciclopedia Britannica usa pressappoco le stesse parole di Bābar nella descrizione esterna dei monti Aravalli che 'send off rocky ridges in a north eastern direction through the states of Alwar and Jaipur, which from time to time reappear in the form of isolated hills and broken rocky elevations to near Delhi '[1]

Mentre Bābar descrive il suo oggetto senza mescolarvi una sua personale interpretazione, ma in modo così plastico e visivo che una spiegazione geologica sorge, se così posso esprimermi, dall'oggetto stesso, Bīrūnī subordina nel brano da noi or ora citato i dati da lui osservati alla sua interpretazione teorica Nel brano bīrūniano quindi l'unità é da ricercarsi in Bīrūnī stesso che con la sua 'teoria' riunisce i frammenti di paesaggio vissuto, mentre nella descrizione bābariana l'unità si ritrova nel paesaggio stesso

L'orografia indiana in generale è inquadrata da Bīrūnī in un ampio e geologicamente esatto cenno all'intera orografia euroasiatica

Bīrūnī I- -197-8, 96

'Immaginate nell'ecumene una catena di montagne eccelse unite fra loro, come delle vertebre, che si estendono lungo le medie latitudini della terra e in longitudine da est a ovest, passando attraverso la Cina, il Tibet, il paese dei Turchi, Kābul, il Badaḫšān, il Toḫāristān, Bāmiyān, Ghōr il Ḫurāsān, la Media (*al-Ǧabal*) l'Azerbaigian, l'Armenia, l'Asia Minore (*al-Rūm*) il paese dei Franchi e quello dei Ǧalāliqa (i Galli) Lungo tutta la sua lunghezza tale catena é anche estesa notevolmente e, inoltre, ha delle sinuosità che racchiudono terre abitate, e n'escono fiumi verso ambedue le direzioni (cioé verso nord e verso sud) Una di queste pianure é l India, limitata al sud dal già nominato Oceano (Indiano) e da tutte le altre parti dalle alte montagne le cui acque scorrono verso di essa '

E' una specie di ampia visione geografica dall'alto che poi si frammenta nelle pagine seguenti in una libresca congerie di nomi derivati da testi sanscriti e in parte non più corrispondenti alla realtà toponomastica della sua epoca

Passando all'orografia indiana come viene descritta da Bābar si ha l'impressione di chi, dopo aver visto un paesaggio a volo di uccello si abbassi per distinguervi i particolari Si perde il quadro di insieme ma si ha l'impressione di una accurata coscienziosità

Bābar 485, 272*b*

Gli indiani chiamano questo montagne[2] Sawālak-Parbat

La neve su queste montagne non diminuisce mai, si vede, bianca,

[1] Encycl Brit s v *Aravalli*   [2] Le montagne settentrionali

da parecchi distretti dell'India, come ad es da Lahore, Sirhind e Sambal La catena montana che a Kābul é nota col nome di Hindū-kuš prosegue da Kābul verso est nell'Indostan, con leggera inclinazione verso sud I paesi dell'India sono a sud di essa, il Tibet a nord [1]

Piu 'da vicino' é tuttavia anche quest'altra descrizione bīrūniana (I—258, 128-9)

Bisogna immaginare che le montagne formano i confini dell'India Quelle che sono a nord sono il Himamant (Himalaya) nevoso Al centro vi si estende il Kašmīr, e son connesse con la terra dei Turchi Questa regione montuosa diviene man mano sempre piú fredda fino alla fine dell'ecumene e al monte Meru Le montagne fredde del nord e le montagne orientali sono in realtà la stessa catena, che si estende verso oriente e poi gira verso sud finché raggiunge il Grande Oceano dove parti di essa penetrano nel mare nel luogo noto col nome di 'diga di Rāma'

Quest'ultimo particolare non é esatto [2] non appartenenendo le rocce che formano 'la diga di Rāma' allo stesso sistema orografico dell'Himalaya Tutto sommato la visione ampia, e quindi non basata sulla sola esperienza, di al-Bīrūnī, talvolta cede alla acuta osservazione piú prudente, sperimentale e alla buona di Bābar

Per quanto riguarda l'*idrografia*, il fiume Indo, passaggio obbligato per tutti i viaggiatori provenienti dall'occidente occupa un posto centrale nell'idrografia indiana sia di Bīrūnī che di Bābar Molto precisa é in Bābar la distinzione di tre bacini quello dell'Indo, quello del Gange e quello degli affluenti del Gange nati dai monti Aravalli Alla chiara descrizione bīrūniana del Pañcanada seguono, poi considerazioni oscuramente teoriche sul settemplice sistema fluviale che, a nord dell'Himalaya farebbe da *pendant* ai fiumi del Panjab

Il preciso brano di Bīrūnī sulle piogge (I—211) non trova riscontro preciso in Bābar O meglio alla documentata e chiara spiegazione teorica delle piogge in Bīrūnī ('quando, poi le nubi raggiungono le montagne, il fianco dei monti urta contro di esse e le nubi son compresse come olive o uva, cosicché ne fluisce la pioggia e le nubi non oltrepassano mai le montagne ') fanno riscontro in Bābar particolari pratici e personali (510, 291) 'L aria dell'India nel periodo delle piogge é molto buona Talvolta piove dieci,

[1] Un altro punto nel quale Bīrūnī é in parte anche *verbatim* simile a Bābar é il seguente (Bīr I—207, 102) 'Di qui si giunge al monte Kularğak (v Mžik 168 nota) che é come una cupola, simile al monte Dunbāwand, la neve vi é perenne e si vede dalla regione di Takēšar e Lahore ' Si tratta di esperienze personali di Bīrūnī

[2] Il *sadd Rām*, come si vede a pag I—209, 102 é fra Ceylon e il Continente e non può appartenere al sistema geologico su descritto

quindici o venti volte al giorno, si riversano improvvisamente torrenti sulla terra e scorrono fiumi dove prima non c'era una goccia d'acqua. Mentre piove e negli intervalli fra le piogge l'aria é notevolmente buona, insuperabile per salubrità e freschezza, il difetto é che l'aria diviene troppo umida'. E più avanti (678, 376b) leggiamo una descrizione di un temporale (*tūfān*) di improvvisa violenza, quasi ad esemplificare ciò cui sopra aveva accennato in generale, che lo sorprende mentre scriveva le sue memorie sotto la tenda: 'prima che potessi raccogliere le carte e i quaderni mi cadde addosso la tenda proprio sulla testa. La tempesta si calmò in circa due *garī* (48 minuti)'.

In contrasto con questa violenza delle piogge, Bābar nota nell'India, ed é cosa che deve averlo particolarmente impressionato perché ci ritorna molto spesso, la mancanza di *āqār sūlār*, lett. acque correnti[1]: é uno dei tanti aspetti della 'stranezza' dell'India cui più oltre accenneremo. Bīrūnī preferisce invece fornire (I 260 segg.) ampi elenchi di fiumi tratti dal Matsya-purāṇa.

Fauna e Flora.—Dei ventitrè fogli del ms. di Hyderabad del Bābarnāma, che racchiudono una descrizione *ex professo* dell'India, ben 13 fogli e una pagina sono dedicati alla flora e alla fauna dell'India: mammiferi, uccelli, pesci, fiori, frutti vi sono descritti con amore e con cura, e cenni ad animali, piante, giardini si trovano anche frequentemente qua e là nelle memorie babariane. Nessun accenno vi é a leggende zoologiche così facilmente reperibili nelle relazione di viaggiatori musulmani e non musulmani,[2] ma osservazioni morfologiche, talvolta molto belle nella loro semplicità.

Bābar 513, 287b

Il fiore del *gāsūn* ha colore più pieno di quello del melograno ed é circa grande come una rosa rossa, però la rosa rossa, quando il bocciolo é cresciuto, s'apre semplicemente, mentre quando s'apre un bocciolo di *gāsūn* si vede uno stelo sul quale crescono altri petali, come un cuore. Sebbene ambedue siano parti di un sol fiore pure l'allungarsi e l'assottigliarsi prominente di quel cuore a forma di stelo formato dai petali aperti per primi lo fa apparire come due fiori. Non é cosa priva di stranezza (*ḫālī az ġarā'ib īmās*). I fiori, di magnifico colore, hanno un bell'aspetto sull'albero, ma non durano a lungo, basta un sol giorno per farli appassire.'

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[1] Talvolta da intendere più particolarmente come 'canali d'irrigazione'.

[2] Si vedano per es. nelle *'Aǧā'ib al hind* le storie di scimmie che si accoppiano ad esseri umani ecc. (*Livre des Merveilles de l'Inde*. Texte arabe ... par P. A. VAN DER LITH, Trad. Franç. par L. MARCEL DEVIC. Leiden, Brill, 1883-86, passim). É interessante tuttavia notare il tono 'scientifico' e *matter of fact* di questi racconti leggendari islamici, che sarebbe interessante confrontare con il, direi, conscio leggendarismo dei racconti mitici indiani.

Nulla di fantasioso e di complicato in questa che chiamerei commossa ammirazione di fronte all'oggetto, cui nulla aggiunge o toglie l'animo semplice e sincero di chi, come Bābar, sapeva scoppiare in lacrime spaccande un fragrante melone portatogli dalla sua terra natia (B 645-6, 359)

Bīrūnī tratta di alcuni animali dell'India specialmente nel capit XVIII la sua curiosità di scienziato teorico lo porta a dare il primo posto proprio a un animale mitico, lo *šarava* (*śarabha*), che

Bīrūnī I—203, 99

ha quattro piedi, ma anche sulla schiena ha qualcosa come altre quattro zampe dirette all'insú Ha una piccola proboscide e due grandi corna colle quali attacca l'elefante e lo spacca in due, ha la forma di un bufalo, ma é piú grande di un *ganda* (rinoceronte) Leggende affermano che esso talvolta colpisce con le sue corna qualche animale e se lo mette, tutto o in parte, sulla schiena cosicché esso si viene a trovare fra le sue quattro zampe superiori Lí imputridisce, e i vermi rodono il dorso dell'animale '

Le stesse tendenze al leggendario si ritrovano nella descrizione dei '*graha* dei fiumi dell'India meridionale Interessante é il modo come Bābar e Bīrūnī parlano delle scimmie

Bīrūnī I- 209 102

Kihkind, che sono le montagne delle scimmie. Ogni giorno il loro re esce con la sue gente, ed hanno particolari luoghi da sedere a banchetto (*mağālis*) preparati per loro La gente di quelle regioni prepara loro riso cotto che portano su delle foglie Dopo mangiato le scimmie tornano nella boscaglia, ma se esse fossero trascurate, questo sarebbe la rovina del paese perchè sono numerosissime ed anche selvagge e aggressive Si crede che esse siano state una razza di uomini cambiati in scimmie per l'aiuto che diedero a Rāma quando combatteva contro i demoni '

Bābar 492, 276*b*-277

Ci sono inoltre le scimmie (*maymūn*) Gli Indiani le chiamano *bandar* Anche di queste ce ne sono varie specie una sola delle quali é quella che viene portata anche nei nostri paesi I saltimbanchi (*lūlī*) insegnano loro dei giochi (*ōyūn*) Questa specie di scimmie si trova nei monti di Nūr-dara, nelle colline del Safīd Kūh presso Khayber e di qui in giú per tutto l'Industan Non se ne trovano piú in su Hanno il pelo giallo, il muso bianco e la coda non molto lunga Un'altra specie, che non si trova a Bağaur, Savād e nei nostri paesi, é

molto piú grande di quelle che portano da noi hanno la coda molto lunga, il pelo bianchiccio, il muso completamente nero. Si trovano sulle montagne e nelle giungle dell'Indostan. Se ne distingue anche un'altra specie, tutta nera, sia nel muso, che nel pelo e nelle membra.

Se si leggono, oltre questi, altri brani sullo stesso animale di Ibn Battūta e delle *'Ağā'ib al-Hind* si noterà che Bīrūnī é, come tono, piú vicino forse ai due ultimi che a Bābar, il quale, nel suo rispetto per la realtà, riesce a superare la invincibile sensazione di 'curiosità' di questo animale cosí simile all'uomo, per dedicarsi invece a una coscienziosa seppur non perfetta distinzione fra le varie sue specie. La sua descrizione é nettamente superiore, dal nostro punto di vista scientifico, a tutte le altre citate.

Questo maggiore senso realistico della natura fisica nelle sue forme piú immediate, é sensibile anche in tanti piccoli episodi narrati nel Bābarnāma[1]. Le osservazioni piuttosto pessimistiche sull'India che Bābar fa verso la fine della sua descrizione del paese sono in fondo smentite da tanti fatti che ci dicono che Bābar in India ci si trovava benissimo, almeno per quanto riguarda la natura fisica. Si pensi ai pesci volanti che vivacemente son colti dalla fotografica narrazione bābariana mentre saltano nelle barche (663, 367*b*), alla giovanile gioia dell'attraversare a nuoto il Gange (655, 365*b*), alla sua attenzione mai sopita anche durante le lunghe spedizioni belliche, per i fiori, alla sua escursione verso Arrah al solo scopo 'di visitare le piante di loto (*nilūfar-zār*)' (666, 369*b*), le masse d'alberi trasportate dal fiume Son (666), le numerose descrizioni di giardini (610, 680) di cascate (614) ecc. Questa natura indiana tuttavia, come é vista e descritta da Bābar, non fa affatto quell'impressione di oscuro e di misterioso che altri viaggiatori come ad es. Ibn Battuta o anche esploratori occidentali particolarmente accentuano. Bābar la descrive con lo stesso sguardo comprensivo e assimilatore col quale parallelamente su un altro piano, Bīrūnī sa guardare—notandone con cura le affinità—le *Weltanschauungen* di una cultura diversa dalla sua. E' il potere di assimilazione, tipico dell'Islam, che si riflette in modi cosí diversi anche in questo campo.

La cultura

La comprensione che Bābar ha per la natura fisica indiana, non é invece accompagnata da una eguale comprensione per la natura spirituale. l'atteggiamento che ha Bābar verso, i fiori, i meloni, gli uccelli dell'India, lo vediamo *mutatis mutandis*, in Bīrūnī per la filosofia, l'astronomia, la religione indiana.

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[1] Sarebbe molto interessante confrontare il senso della natura in vari scrittori musulmani. Il Bābarnāma potrebbe fornire buon materiale per uno studio di tal genere: bellissima nella sua semplice fotograficità la descrizione dello stagno di *Āb-i istāda* presso Ghazna (Bāb 239 40, 153).

Sull'argomento cultura Bābar—e questo é solo in parte giustificabile colla considerazione che egli venne come guerriero e conquistatore e per di piú in un epoca di maggiore islamizzazione dell' ambiente—ha solo qualche cenno

E' interessante paragonare, per cominciare dal lato piú esteriore, qualche osservazione dei due scrittori su argomenti linguistici

Bīrūnī ci comunica interessanti osservazioni sulla evoluzione linguistica

Bīrūnī I—299, 149

> Tuttavia ciò che é piú strano é che talvolta la stessa lingua cambia nella bocca della stessa gente che la parla, col che nascono strane forme di parole comprensibili solo a chi non tien conto delle regole grammaticali (*al-šādhdh*) In tutto ciò gli indú sono spinti dal desiderio di avere quanti piú nomi (*asāmī*) é possibile

Altri concetti similmente alquanto esteriori si trovano all' inizio dell'opera bīrūniana (Bīrūnī era giustamente colpito—cfr pag I—18, 9-dalla enorme abbondanza del lessico sanscrito) Qua e là si trova qualche osservazione su fenomeni fonetici dei vernacoli indiani come la frequenza degli scambi fra *kh*, *ḫ*, e *š*, sulla presenza di certi suoni 'impronunciabili' e indistinguibili per l'orecchio non indiano (le cerebrali) [1]

Bābar invece si limita appunto solo a citare qualche singola particolarità fonetica del vernacolo del suo tempo e dei luoghi da lui visitati (interessante l'osservazione che dimostra che già alla sua epoca era diffusa la tendenza a pronunciare molto breve la seconda *a* di parole tipo *ḫabar* pag 380, 223*b*) e solo in un punto si lascia attrarre a teorizzare, d'altronde molto semplicemente, per fare una etimologia (491, 276*b*) e in termini molto prudenti

> 'In industani lo [2] chiamano *kalahara* il che nell'origine può essei stato (*ikan-dur*) *kālā haran* cioé daino neio (*qara giyik*), poi alleggerito (*taḫfīf*) in *kalahara* '

Una qualità generica del mondo indiano che Bābar nota piuttosto nel campo pratico mentre Bīrūnī la scorge specialmente in quello dello spirito, ma che ha colpito ugualmente ambedue gli scrittori é l'*asimmetria* e il *disordine* dell'India Vi accennano piú di una volta ambedue poiché si tratta a mio parere di punti di grande interesse cito i singoli passi

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[1] Si veda su questo lo studio del SACHAU *Indo-Arabische Studien zur Aussprache u Geschichte des Indischen in der ersten Haelfte des XI Jhr* Berlin, 1888. Si cf per le teorie indiane sulla lingua, O STRAUSS, *Altindische Spekulationen uber die Sprache u ihre Probleme*, in ZDMG, 1927, pag 99

[2] L' 'Antelope Cervicapra'

Bīrūnī I—89, 43

gli stessi indú non lo[1] poliscono (*la yuhadhdhibūnahu* gli indú raramente preservano l'ordine e son molto arbitrari nelle loro enumerazioni

id 361, 182 tutto ciò che é privo d'ordine (*'adīm al-nizām*) é ripulsivo per la nostra natura e sgradevole al nostro orecchio Ma questa gente menziona un enorme numero di nomi inventando colossali numeri

id 25, 12 Gli indu non hanno uomini di questo stampo (cioé come Socrate) anche i teoremi scientifici degli indú sono in uno stato di estrema confusione (*idtirāb*) e in cattivo ordine (*sau' al-nizām*) e in fondo sempre mescolati con le fiabe del volgo, come enormi numeri, colossali spazi di tempo, ecc

Bābar 487, 274 Le città e le regioni dell'Indostan sono molto poco graziose (*bī-safā*)

id 518, 290*b* nel loro artigianato e nei loro lavori non c'é né forma né simmetria, né metodo né qualità (*siyāq anaām*, ecc)

id 532, 300 Cosí (dopo le mie costruzioni) in quest'India sporca e asimmetrica (*bī-safā wa bī-siyāq*) si videro giardini ordinati e simmetrici, con gradevoli aiuole in ogni angolo e in ogni aiuola rose e narcisi perfettamente ordinati (*mukammal murattab*)

id 608, 340*b* Essi (i palazzi del rāǧā di Gwalior) sono magnifici edifici, ma tuttavia fatti di blocchi pesanti e asimmetrici (*bī-siyāq*)

id 611, 341*b* portici che sono bassi (*past*) e informi (*bī-andām*) e, secondo l'uso indiano, di cattivo gusto (*bī-maza*)

Le testimonianze dei due scrittori su questo argomento si ...npletano nel modo piú perfetto Bīrūnī ha sentito ed espresso il ...o disagio di fronte alla smisuratezza dell'India spirituale, Bābar ...fronte al disordine dell'India materiale Ambedue, come vedremo ...bbiamo in parte già visto, salvano però qualcosa dell'India, quel ...alcosa che, é a loro parere comune sia all'India che al loro mondo, ...che per Bābar sarà la natura, per Bīrūnī quella teologia naturale ...mune a tutte le civiltà e che non e che la *fitra* islamica

Bābar, oltre a far notare la dissimmetria, batte anche piú ...una volta sulla *sporcizia* (487 274), nota il modo sporco di irri...zione usato dagli indiani e accentua ripetendolo due volte, la ...orcizia del sistema di illuminazione notturno mediante quelli che ...li chiama *dīwatī*, i *dawādaw* di Ibn Battuta[2] Bīrūnī chiama

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[1] L'argomento del capitolo cioé *Aǧrās al-Ḫalā'iq wa asmā'uhum'* Le vane ...ssi degli esseri creati e il loro nome

[2] Mžik, op cit, 226 Ibn Battūta accenna appena a questo strano costume, ...se troppo poco 'curioso' per lui mentre Bābar, sempre attento a ciò che interessa ...nta reale piu che la fantasia, ne fa una precisa e visiva descrizione

piuttosto strani che sporchi alcuni curiosi costumi indiani (I—179 segg ; 88)

Tali critiche a una essenziale 'informità' dell'India, che testimoniano della ellenica *mesótēs* penetrata nella cultura islamica, si ampliano anche alla contemplazione più generica della radicale diversità generale fra mondo indiano e mondo islamico

Bīrūnī afferma addirittura (I—179, 89)

> Si potrebbe quasi pensare che abbiano capovolto i nostri usi a bella posta, perché i nostri costumi non solo non somigliano ai loro ma sono esattamente l'opposto

Segue un elenco delle stranezze degli indiani per lo più riguardanti usi e costumi, norme religiose o civili Ecco invece come Bābar parla della diversità dell'India

Bābar 484, 272

> Paragonato ai nostri paesi é un mondo differente (*ūzkā 'ālamī-dūr*), le sue montagne, fiumi, giungle e deserti, le sue città, i suoi campi coltivati, gli animali e le piante, la gente e le loro lingue, le piogge e i venti, tutto é differente Una volta passato il fiume Sind ogni cosa é al modo indiano '

E Bābar accenna ancora a questo in una quartina da lui improvvisata [1]

E' interessante notare come anche qui Bābar in ambedue i luoghi pone l'accento non tanto sulle diversità culturali ma su quelle fisiche, e senza poi esagerar troppo la cosa, mentre quel tipico intellettuale che fu Bīrūnī si dedica a fare un lungo 'elenco' di stranezze, traendone poi conseguenze teoriche più o meno giuste come quella sulla innata perversità della natura indú (*amṯālu dhalika li-mā fī'l 'azīza min in'ikās al-tabī'a*)

Per quanto riguarda la religione e i costumi, la cultura nella sua accezione più ampia, Bābar se la sbriga, come accennammo, molto presto tale aspetto dell 'India lo ha colpito soltanto per qualche estrinsecazione pratica, esteriore o curiosa E solo da questo lato quindi che può porsi una comparazione diretta con Bīrūnī

La maggiore ampiezza é data, in questo campo, a quell'aspetto cosí pratico, esteriore e normativo della cultura che é il sistema di pesi e misure Dato lo scopo di queste pagine, non é il luogo di fare uno studio di metrologia comparata, bensì solo ci interesseremo del *come* i due autori presentano l'argomento Sia Bīrūnī (I—334 segg , 169 segg, I—160 segg , 76, I—361, 182) che Bābar (516, 289 segg) dividono il nychtemeron di 24 ore in 60 *ghaṛī* (scritto گهری in Bīr , گری in Bābar) Ma mentre Bīrūnī divide

[1] Bab 526, 296.

il *gharī* in 60 *ǧašak* (*cašaka*), Bābar chiama lo stesso periodo di tempo *pal*, e aggiunge 'Dicono che la lunghezza di un *pal* é uguale al chiudere e aprire le palpebre per sessanta volte, il che in un nychthemeron farebbe 216 000 batter d'occhi L'esperimento (*taǧruba*) mostra che un *pal* é eguale a otto ripetizioni di '*Qul huwa 'llāhu aḥad*' e '*Bismillāh*' il che fa 28 000 ripetizioni della detta formula in un nychtemeron '

Bīrūnī tuttavia nota 'Al Fazārī usa nel suo manuale astronomico (*zīǧ*) la parola *pal* per minuti del giorno (*daqā'iq al-ayyām*) Non ho trovato mai quest'uso della parola nella letteratura indú, ma essi la usano a indicare una correzione (*ta'dīl*)' [1]

Dopo aver accennato alla divisione nycthemeton-*gharī-pal*, Bābar nota la divisione della notte e del giorno rispettivamente in 4 *pahar* corrispondente al persiano *pās*, e si dilunga in una precisa descrizione del servizio orario dei *gharīālī* (quelli che suonano il *gharīāl* o gong) con l'aiuto di clessidre, e delle disposizioni da lui date per perfezionare il sistema

Per Bīrūnī 'Gli indú hanno oggi anche una divisione *popolare* (*qisma 'āmmiyya*) del nychthemeron in otto *prahar* o turni di guardia In alcuni paesi hanno clessidre regolate secondo il *gharī* colle quali si determinano i tempi degli otto turni di guardia Quando un turno, che dura sette *gharī* e mezzo, é passato, battono il tamburo o suonano una conca che chiamano *šānk* (*śānkha*) e in persiano *sapēd-muhra* Io ho visto questo nella città di Purshūr (prob Peshavar)' Questa osservazione personale é annegata in una grande congerie di citazioni libresche molto svariate discusse con grande accuratezza Bābar accompagna le sue indicazioni con una ammirativa osservazione 'Gli abitanti dell'India hanno anche ben ordinate misure (*wazn*)' Egli é anche stato colpito dall'eccellente modo di contare (*ḫub ta'yīn qilip*) i famosi 'enormi numeri' dell'India, che hanno stupito orientali e occidentali[2] e aggiunge 'La fissazione di numeri cosi alti é prova della grande quantità di ricchezza che c'é in Indostan [3] Interessante é vedere invece quale ragione dà Bīrūnī del fenomeno dei grandi numeri

'Quando essi arrivano a un capitolo come questo (sulle grandi misure di tempo) ripetono gli stessi nomi per molti esseri, misurano loro la vita e creano grandi numeri (*tawwalū 'l-a'dād*) Questo é quello cui mirano nessuno glie lo può impedire e i numeri se ne stanno dove si mettono ma devono nel

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[1] Invece il termine *pala* per *vighatika* cioé nel senso di Bābar, é documentato in sanscrito v Böthlingk s v *pala* *Daqā'iq al-ayyām* sono invece per Bīr i *gharī*

[2] Sui numeri enormi v ZDMG 15, pag 132 segg

[3] Del resto nel *Mahābhārata*, II 2143-44 Yudhishtira si serve appunto di tali enormi ordini di numeri per contar le sue ricchezze, il che sembra confermare indirettamente la ragione portata da Bābar

complesso esser considerati come un mezzo filosofico di introdurre un valore astratto di tempo, piuttosto che come veri e propri valori matematici

La spiegazione é molto acuta e sostanzialmente giusta: qui anzi Bīrūnī dimostra di aver capito quel simbolismo di certe manifestazioni del pensiero panteistico indiano che egli altrove da buon teista mostra di non comprendere affatto (si veda proprio a questo stesso proposito ciò che dice alla fine del cap XXXIX)

E' inutile dire che sia gli ordini di numeri che le misure di capacità e di peso corrispondono solo parzialmente in Bīrunī e Bābar [1]

Ciò che piú interessante si può ricavare da questo capitolo é l'accuratezza e l'interesse che ambedue gli autori mostrano per queste questioni metrologiche, che a noi possono sembrare quasi inutili E' un concreto particolare di quell'interesse per le questioni normative, per le divisioni e suddivisioni esteriori, cosí frequente nella cultura islamica, da questo lato piú ordinata sì, e meno farraginosa della indú, ma forse meno 'profonda'

Religione e Filosofia sono la base e il centro dell'opera sull'India di al-Bīrūnī, mentre non se ne hanno che scarsissimi cenni in Bābar Essi si possono ridurre ai seguenti

Bābar 518, 290-290*b*

La maggior parte degli abitanti dell'Industàn sono pagani un pagano (*kāfir*) lo chiamano *hindū* La maggior parte degli indú credono alla trasmigrazione delle anime Tutti gli artigiani, i salariati e i funzionari sono indú Nei nostri paesi gli abitanti nomadi hanno dei nomi tribali (*qabīla ātlārī*), qui invece sono i sedentari che abitano campi e villaggi che hanno nomi tribali (nomi di casta) Inoltre ogni artigiano segue la professione che gli é stata tramandata dai suoi antenati di generazione in generazione

id 520, 291*b*

Un'altra buona cosa dell'India é che ci sono innumerevoli artigiani di ogni specie C'é una casta fissa (*ǧam'ī*) per ogni specie di lavoro e per ogni cosa casta che ha fatto quel lavoro o quella cosa di padre in figlio fino ad oggi '

Metempsicosi e caste ecco i due punti della religione indiana che hanno principalmente colpito Bābar Appare tuttavia chiaro che egli é ben lungi dal riconoscere il carattere religioso delle caste Molto piú empiricamente (e, chissà, anche piú correttamente?) le basa unicamente su rapporti di lavoro

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[1] Del resto tali misure sone variabili anche nei testi indiani stessi Per quanto riguarda gli ordini di numeri l'*arb* di Bābar corrisponde al *padma* di Bīrunī il *nīl* al *śanku* bīrūniano, il *padam* invece al *madhya* ecc

E' tutta l'opera di al-Bīrūnī che può fare da *pendant* a questi pochi cenni di Bābar sulla religione indú, pressoché inutile é quindi trascegliere citazioni Tuttavia é interessante notare che anche Bīrūnī scrive

Bīrūnī I—50, 24

Cosí come la professione di fede nell'unità di Dio é il segno distintivo della fede dei musulmani e la trinità quello dei cristiani e il sabato quello degli ebrei, cosí la trasmigrazione (*tanāsuḫ*) é la bandiera della religione indú [1]

La metempsicosi, che é come dire il panteismo in forma palpabile, é per queste due personalità musulmane dunque l'*essenza* della religione indiana anche il superficiale Bābar ha saputo superare la elementare considerazione degli indiani come semplici politeisti e vedere anche lo strato piú vivo (la metempsicosi panteistica) che é alla base di questo politeismo

Bīrūnī approfondisce molto di piú la questione e vede al disotto del concetto pagano del politeismo indú la credenza *in un solo Dio*. Questa sensazione di un contatto fra le due religioni è stata provata piú di una volta nel mondo islamico, si pensi ad Akbar, a Dārā Šikūh, l'autore della 'Confluenza dei due mari' (*Maǧma' al-Bahrayn'*) Comune a tutti questi tentativi di avvicinamento é a mio parere una interessante incomprensione da parte musulmana del punto di distinzione cioé che il Dio unico indú, apparentemente munito di molti degli attributi del Dio islamico (v Bīr I—27 segg 13 segg) é in fondo un dio impersonale, di fronte al Dio islamico che é lo stesso Dio semitico di Abramo, di Isacco e di Giacobbe e che é soprattutto personale [2]

A questa possibilità di avvicinamento delle due concezioni, cui mai certamente sarebbe giunto Maometto o un antico israelita, possono—seppur parzialmente—giungere al-Bīrūnī e i suoi successori

[1] Malgrado l'apparente eterogeneità di questi *shibboleth* delle varie religioni non si può non ammirare l'acutezza di al Bīrūnī Tradotte in termini moderni queste sue 'essenze' delle grandi religioni si chiamerebbero concetto di Dio vivo e incarnabile nel Cristianesimo, 'legalismo giudaico, panteismo indú

[2] Anche ad es Dāra Šikūh (m 1659) lo sfortunato principe che tentò di conciliare islam e induismo, aveva, sembra, poco compreso le differenze essenziali che sussistono fra le due posizioni religiose Particolarmente interessante ad es la questione XI degli 'Entretiens de Lahore' (v *Les entretiens de Lahore entre le prince impérial Dârâ Shikuh et l'ascète hindou Bâba La'l Das par Cl Huart et L Massignon* in Journ Asiat 1926 (209) pag 317) sulle differenze fra creatore e creatura Giustamente il Massignon afferma a proposito dell'altra opera di Dārā Šikūh, '*Maǧma al-Bahrayn* (v MASSIGNON-KASSIM *Un essai de bloc islam-hindou au XVII siècle* RMM LXIII 1926, pag 7) si la pensée initiale est originale la réalisation manque de fermeté et de méthode' e, aggiungo di vera comprensione di ciò che egli alla fine della sua prefazione al *Maǧma* chiama monoteismo indú (v *Maǧma al-Bahrayn* ed e trad *Mahfūz al-Haqq* Calcutta, 1929)

specialmente e essenzialmente perché l'originario concetto semitico puramente extra-filosofico del Dio personale e volitivo si é man mano contaminato (come in tutte le grandi religioni monoteistiche rivelate si pensi all'aristotelismo cristiano) con i concetti del Dio unico impersonale e filosofico della speculazione greca, piú simile in fondo a quella indiana [1]

Non é pertanto un paradosso se diciamo che molto piú sanamente e profondamente islamica (cioé semiticamente anti-panteistica) ci sembra la posizione di Bābar, certo non troppo nutrito delle speculazioni dei *falāsifa*, verso l'induismo, il quale su questa base e in questo senso é completamente inconciliabile con l'islam e che perciò egli, uomo del suo tempo, trascura o anche tratta con disprezzo Con quella semplicità islamica che é qualcosa di piú e di meno dell' 'intolleranza'[2] Bābar dice ad es a proposito del rāğā di Gwalior 'Nella sconfitta di Sultān Ibrāhīm il rāğā di Gwalior Bikramāğit l'indú se ne andò all'inferno' (477 268, 268*b*)

Con questo non si vuol certo dire che Bīrūnī sia stato un simpatizzante indú tutt'altro Anzi egli mostra piú di una volta la sua irritazione di dotto per le 'favole popolari', le *ḫurāfāt* degli indú 'quando essi abbandonano il sentiero della speculazione filosofica e si volgono a favole tradizionali' Con analisi spesso acuta, mostra (I—32, 15) l'origine psicologica di tali *ḫurāfāt* come ad es quella che Dio é lungo 12 dita e largo 10, ma mostra altrove una incomprensione che non so meglio se chiamare semitica o razionalisticamente greca per quel realistico e pesante simbolismo, anche per noi indubbiamente cosí farraginoso, dell'induismo Si veda per esempio il capitolo sulle istituzioni, dove considera i Rsi come 'profeti', e alla fine del quale inorridisce per la malvagità (*qabāḥa*) delle usanze indiane di fronte alla bellezza della verità (*husn al-haqq*) dell' Islam (I 110, 53)

Sulle origini dell'idolatria B ha, come molti autori musulmani, dei concetti semplicisticamente evemeristici (I—111, 53-4), anche qui gli riesce difficile comprendere il valore che non solo il popolino, come egli sostiene (I—112 segg) ma anche in fondo seppur un po' diversamente, i dotti indú danno al simbolismo idolatrico [3] Altro esempio di intellettualismo che crede di aver facilmente trionfato sull'avversario, il lettore lo può trovare a pag I—117, 56

[1] Per far comprendere meglio ai suoi lettori i concetti indiani Bīrūnī ricorre spesso come é noto a paragoni col sufismo Quanto però le concezioni del misticismo musulmano siano sostanzialmente dissimili, malgrado certe apparenze, dalla speculazione indiana, é stato brillantemente dimostrato dal MORENO nel suo recente studio *Mistica musulmana e mistica indiana*' Annali Lateranensi X, 1946

[2] La nota della Beveridge a questo passo mi sembra completamente inutile L'intolleranza é sempre in certo modo frutto di convinzione !

[3] Ai nostri tempi perfino il Mahātma Gandhi, nel suo credo pubblico del 6 ottobre del 1921 accettava dell'induismo anche il culto degli idoli Cfr R ROLLAND *Mahatma Gandhi*, Paris, 1924 pag 35

ad es (a proposito della possibile durata del legno) Talvolta Bīrūnī sa essere anche garbatamente ironico verso la mentalità indú! (I—291, 145)

> Gli indú non possono mai parlare di nessuna cosa intelligibile o immaginaria senza darle un corpo sensibile Poi si affrettano a farla sposare, a portare la sposa dallo sposo, a far che la sposa poi concepisca e partorisca!

Con questo interrompo le citazioni su questo argomento, un attento lettore può trovare facilmente nell opera bīrūniana da una parte tracce di intellettualismo razionalista greco, dall'altra tradizionalistico anti-panteismo semitico due posizioni mentali che, fuse più o meno bene insieme, velano talvolta la sua mente in diversi modi e per diverse vie, alla comprensione totale del vivace e policromo e turbinoso politeismo panteista indú

Sulle *caste*, per passare al secondo argomento di cui tratta anche Bābar, Bīrūnī é, in fondo, d accordo con Bābar nel riportarne l'origine, diversamente da quanto farebbe un ortodosso indú a cause sociali ed economiche

L'inizio del cap IX di Bīrūnī, cui il Sachau ha voluto dare l'anacronistico ed equivoco sottotitolo di 'Throne and altar', é una dimostrazione degna di un Machiavelli della grande utilità pratica per i sovrani dello sfruttamento della religione a scopi politici E' interessante che Bīrūnī da prima sembra quasi ammirato di fronte a quest'opera di 'classificazione religioso-politica degli antichi re che 'preoccupati dei doveri del loro ufficio (*ma'niyyūn bi-sinā'atihim*) si davano la massima cura per dividere i loro sudditi in differenti classi (*tabaqāt*) e ordini che preservavano da miscele e disordine ', mentre poco sotto dedica una riga o due a dire che 'però per l'Islam tutti gli uomini sono uguali, anzi che questa concezione é il più grande ostacolo a una comprensione tra indú e musulmani '

Nel complesso la lunga introduzione al capitolo sulle caste non può non lasciare l'impressione di una certa nostalgia dell'iranico al-Bīrūnī per gli antichi sovrani 'classificatori'

Parallela a questa, ma su un altro piano, é l'ammirazione di Bābar per le caste artigiane la presenza di innumerevoli artigiani divisi in ordinate *tabaqāt* é per lui uno dei 'vantaggi dell'India' [1]

Un meno importante aspetto della vita etnico-culturale indiana di cui si trova cenno in ambedue gli autori è quello dei giocolieri, incantatori ecc Bābar, come é suo solito, narra sue esperienze personali con i *lūlī*, elencandone le prodezze, di alcune delle quali sono

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[1] In questa divisione dei difetti da un lato e dei pregi da un altro é da notare che Bābar nella sezione destinata ai difetti parla piuttosto di caratteristiche degli abitanti e dei costumi, mentre la parte dei pregi é in buona parte occupata da pregi 'naturali', clima ecc dell'India

incapaci quelli del suo paese, prodezze specialmente di tipo acrobatico (633, 353, 353*b*) Bīrūnī é invece piuttosto colpito (I—194-5, 95-96) da incanti e talismani contro il veleno dei serpenti, da fenomeni di ipnotismo su uomini e su animali, cercando di darne almeno in parte spiegazione Concludendo afferma sensatamente

> *Bīrūnī* I—193 95
>
> Per quanto riguarda scongiuri e stregonerie (*al-'azā'im wa 'l-ruqā*) gli Indú ci credono sinceramente e la massa é molto incline a queste cose Talvolta gli indú sono considerati dei maghi perché giocano con palle su dei legni piantati in terra o su corde, ma in queste cose tutte le nazioni sono uguali

Questo prova ancora una volta l'interesse precipuo per la teoria in Bīrūnī, per i fatti in Bābar [1]

Per quanto riguarda l'arte indú essa é sia agli occhi di Bābar che di Bīrūnī inficiata da quella 'asimmetria' che già vedemmo Ma ambedue, con gran senso di praticità, lodano le realizzazioni concrete dell'artigianato indú La costruzione di speciali pozzi (*wā'in*) e laghi artificiali sacri pare abbia colpito ambedue (Bir II 144 224, Bābar 532-33, 300, 301) ed anche Ibn Battūta [2] La descrizione di Babar é forse piú esatta di quella di al-Bīrūnī, il quale scivola immediatamente a parlare delle località sacre varie in cui i laghi artificiali piú noti si trovano

Quanto ai palazzi, ai templi e alle statue, Bīrūnī si occupa della descrizione di alcuni idoli nel cap XI per passare subito alle leggende che li riguardano. Molto interessante la spregiudicata praticità di Bīrūnī a proposita degli idoli

> *Bīrūnī* I—116 56
>
> Quando Muhammad b al-Qāsim b al-Munabbih conquistò Multan pensò meglio lasciare l'idolo dove stava, ma gli appese per sfregio un pezzo di carne di vacca al collo ..
> il tutto perché portava molto denaro in città l'afflusso dei pellegrini indú

I Carmati invece, deplora al Bīrūnī, 'fecero a pezzi l'idolo e ne uccisero i sacerdoti E' evidente la sua preferenza per il primo modo di trattar l'idolo preferenza che spicca ancor meglio in un altro passo (I—124 60) dello stesso capitolo dove Bīrūnī porta, a conferma della sua ipotesi che gli idoli non siano che monumenti eretti a *tadhkīr* e *tasliya* (ricordo e consolazione) dei morti, il contegno di Mu'āwiya che vendeva gli 'idoli' (probabilmente immagini sacre)

[1] Curioso che per Bīrūnī gli *yogī* sono dei filosofi par Ibn Baṭṭūta dei maghi (Mzik, 268 segg), per Bābar probabilmente non sono che dei *lūlī*, dei prestidigitatori

[2] Ibn Baṭṭūṭa descrive accuratamente un *bu'in* (Mžik 255-57) che egli ben conosceva per esservisi rifugiato in un momento di grave pericolo

presi come bottino nella conquista della Sicilia, ai principi pagani del Sind senza scrupolo alcuno, perché, afferma approvando Bīrūnī, considerava la cosa dal punto di vista politico, non religioso (*fī hukm al-ayāla lā al-diyāna*)[1]

Si confronti quanto, invece, Bābar, anch'egli pratico, ma da un altro punto di vista, dice degli idoli di Urwāh 'Urwāh non é un brutto posto ma ha il difetto che vi sono gli idoli Io da parte mia ordinai di distruggerli' (612, 342*b*) Ciò tuttavia non gli impedisce di descrivere edifici profani come i palazzi del rāǧā di Gwalior (608, 340*b* segg) templi indu (613, 343) e di affermare dei primi che sono 'magnifici edifici' (*garīb 'imāratlar*)

Senso pratico dunque da ambe le parti, ma nel primo caso (Bīrūnī) giustificato da ragionamenti e appoggiato da fatti non personalmente vissuti ma rivissuti semmai internamente, nel secondo appoggiato per cosí dire all'oggetto Per parlare in termini di psicologia junghiana ci sarebbero, credo, sufficienti elementi per affermare essere Bīrūnī un tipo introvertito Bābar un estrovertito

Riassumendo credo si possa e si debba rispondere a queste domande che possono interessare la storia della cultura Hanno colto Bīrūnī e Bābar qualcosa come essenziale nel fenomeno India'? Hanno queste due personalità musulmane compreso esattamente la differenza fra i due mondi? E servita l'esperienza India ad arricchire la loro personalità culturale e per mezzo loro la cultura islamica? Hanno Bīrūnī e Bābar detto qualcosa all'India, hanno significato qualcosa per l India?

Alla prima domanda rispondiamo nettamente di sí Sia Bīrūnī che Bābar hanno, mi sembra, sentito come essenziale nell' India una indifferenziata e disarmonica unitarietà, vi hanno sentito, mi si perdoni la strana espressione, il senso del farraginoso Ne abbiamo portato varie prove nelle pagine che precedono e il loro numero potrebbe forse aumentarsi Chiunque come i musulmani, sia imbevuto di una cultura religiosa profondamente teistica, una cultura che concepisce Iddio come persona onnipotente nettamente distinta dal mondo della natura che è sua schiava e *creata* da lui che su di essa opera per libero e arbitrario atto della sua volontà, per chi é nato in questa atmosfera culturale il fenomeno India non può non fare a prima vista una impressione sia pur vaga di *confusione.* Particolarmente interessanti sono a questo proposito le considerazioni di Bīrūnī su tutto quanto é per lui il lato 'popolare', *'āmmī,* della cultura indù, che egli molto diligentemente contrappone a quello dei veri dotti, più vicino secondo lui al suo Ora, come già sommariamente accennammo, questa netta distinzione che attraversa tutta la sua opera sull'India é basata su una incomprensione per il simbolismo quale può essere concepito consciamente o inconsciamente da dei panteisti Se si pensa che certe, per Bīrūnī, 'superstizioni popolari' come l'estrema venerazione per la vacca ad es, furono

nei nostri giorni apertamente professate da indiani di altissima cultura e d'animo nobilissimo quali il Mahātmā Gandhi[1] si comprenderà che la distinzione bīrūniana fra fede popolare e teoria dotta in India é, almeno in parte, non esatta e troppo semplicistica e deriva, oltre che da quanto abbiamo già detto, da una più o meno confessata tendenza a 'conciliare' sul piano più elevato le teorie dei dotti indù col modo di vedere della filosofia bīrūniana

In Bābar la stessa 'confusione' é sentita, come é da aspettarsi da un estrovertito, sotto l'aspetto più esteriore di dissimmetria e sporcizia Anche di questo abbiamo portato sopra una sufficiente documentazione Qui aggiungiamo che Bābar, proprio perché riflette meno teoreticamente e si lascia andare di più alle sue sensazioni di amante della natura, riesce forse a sentire la natura esteriore dell'India per lo meno tanto intensamente quanto Bīrūnī quella spirituale, se non di più Gli yogi non sono qui che semplici *lūlī* ma Bābar con più fanciullesca semplicità e involontaria cordialità si diverte a vederne le bravure L'India é una 'paese di poco fascino' ma come é bello ci dice implicitamente[2] tutto il Bābar-nāma, attraversare a nuoto il Gange, correre attraverso le fitte foreste, visitare spumeggianti cascate, laghi giardini!

Un'altro aspetto di questo effetto fondamentale che l'India fa sulle nostre due personalità musulmane é quello dell'*illogicità* dell India Abbiamo gia citato il passo in cui Bīrūnī sembra attribuire a una innata 'perversità' (nel senso etimologico della parola) della mente Indiana, certe strane usanze 'Gli indù, afferma altrove Bīrūnī (I=89, 43) sono gente che raramente mantengono lo stesso ordine nelle cose e nelle loro enumerazioni c'é molto di arbitrario' e (I=263, 132) esalta la chiarezza e la logica semplicità del Corano a proposito della forma del cielo e della terra, di fronte alle fantasie indiane (monte Meru ecc)

Più che di logicità si tratta piuttosto, nel pensatore musulmano, di un sano empirismo La spiegazione che egli dà della miscela fra la dottrina dei dotti e le credenze superstiziose del volgo (I=265 132) é un tipico esempio di tale lineare buon senso empirico che non sempre d'altronde coglie nel segno Nella fattispecie si tratterebbe di una forma di *do ut des* il popolo ha grande venerazione per i dotti astronomi e dichiara che tutti andranno in paradiso e nessuno all'inferno in cambio di questa per loro molto utile venerazione i dotti non solo sopportano ma accettano anche nei loro libri le favole popolari per non compromettersi Questa spiegazione, che forse

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[1] Si vedano le sue entusiastiche e, per degli occidentali, quasi incomprensibili affermazioni sulla importanza del culto per la vacca in *Young India* articoli del 16 marzo 8 giugno, 4 agosto 1920 6 ottobre 1021

[2] Il senso pratico di Bābar é esplicitamente visibile ad es nei suoi consigli ad Humāyūn nella lettera scrittagli il *Rabī'* I 935 (Nov 1528), come quello di scrivere senza elaborazione (*bi-takalluf*) e con grande semplicità

può anche a prima vista colpire per la sua acutezza, é in realtà semplicistica e illuministica, e di uno che non ha compreso a fondo il valore positivo delle 'favole popolari' Molti altri esempi si potrebbero portare di questa tipica logicità di tipo 'scolastico', di cui Bīrūnī come ogni musulmano colto dell'epoca è imbevuto[1], essa é un tratto che lo unisce in fondo a Bābar, il cui profondo buon senso empirico traspare da tutta la sua opera La differenza é evidentemente solo nel campo sul quale tale logica che mi piace chiamare esteriore, ed é in fondo la logica aristotelica semiticizzata, si esercita

Alla seconda domanda risponderei un sí con riserva E' chiaro che le differenze fra mondo indiano e mondo islamico sono state sentite fortemente da ambedue gli autori, ma non a mio parere nel punto essenziale La differenza essenziale tra mondo spirituale islamico e mondo spirituale indiano sta, più ancora che nella abusata e troppo ripetuta distinzione fra immanenza della divinità in India[2] e sua trascendenza nell'Islam, nella concezione, ripetiamolo, di un Dio *personale* nel mondo islamico e di un Dio *impersonale* in quello indù Parallelamente si può aggiungere che la religiosità indiana é religione di conoscenza, gnosi, *jñāna* la islamica d'azione, pratica[3] L'induismo purificato da ogni scoria di superstizioni, porta, in fondo, a una filosofia, mentre nell'islamismo anche purgato di ogni sovrastruttura, resta sempre un residuo profondamente religioso-emozionale il rapporto dinamico fra uomo e Allāh da persona a persona Ora Bīrūnī, sfruttando quella concezione filosofica del divino che l'influsso del pensiero ellenico ha fatto penetrare anche nell'islamismo (come del resto nel cristianesimo) cerca talvolta come ho detto di avvicinare i due concetti di divinità musulmana e indu 'dotta' E' anzi interessante, e ben noto che egli, quando vuol fare tali paragoni e impostare tali somiglianze, usa specialmente detti e concezioni dei sūfī cioe di quella variopinta corrente di pensiero islamico che può essere stata influenzata da molte fonti ma come pare più probabile specialmente dal neoplatonismo, originario o cristianizzato oppure vi paragona concezioni greche addirittura

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[1] Tutto il *modernismo* musulmano é imbevuto *in fondo di tendenze razionalistc*, mentre ad es stà proprio nell'irrazionalismo (fideismo ecc) una delle tentazioni più vive del modernismo cristiano Anche il Saiyid HASAN BARNĪ nel suo studio su al-Bīrūnī, già citato, mette in evidenza a pag 22 che *madhab-i ilāhi 'aql-kī muhālif nahīn ho-saktā* (la religione divina non può esser contraria alla ragione)

[2] Uno studio accurato delle varie correnti del pensiero indiano mostra come panteismo e immanenza talvolta troppo genericamente presi come *shibboleth* della mentalità indu sono da intendersi molto *cum grano salis* V anche LACOMBE *L' absolu selon le Vedanta* Paris, 193. pag 66 e passim

[3] Le acute '*Six Lectures on the Reconstruction of Religious Thought in Islam*' di SIR MUHAMMAD IQBAL (Lahore, 1930) cominciano proprio con la giusta osservazione The Quran is a book which emphasizes ' deed rather than idea' (pag 1)

To theîon dei filosofi greci e il Dio della gnosi (*ma'rifa*) sufica[1] sono indubbiamente più vicini al Dio indù di quanto non lo sia il Dio del Corano, onnipotente e misericordioso prima che infinito o sostanza assoluta

In Bābar naturalmente non v'é sentore di tutto questo ma proprio perche più alieno da sottigliezze metafisiche egli capisce forse meglio la differenza fra i due mondi L'elenco dei suoi difetti dell'India comincia con la interessante affermazione l'India é *kam-latāfat yer* luogo poco grazioso e *elī-dā husn yōq* nei suoi abitanti non v'é bellezza La mancanza di husn e latāfat è il centro di tutta la sua critica all'India Il che implica per lui anche mancanza di gentilezza e buona educazione (*muruwwat, adab*) e anche di perspicacia (*idrāk*) Si pensi alla architettura islamica che é ordine e armonia di fronte a quella indù che pur nella grandiosità multiforme dei suoi templi evoca in noi quasi un senso di angoscia e direi di 'contorto', e si comprenderà come tale atteggiamento di Bābar derivi anch'esso da una posizione di partenza che ha alle sue radici un tipo di mentalità religiosa non dissimile dalla nostra (Dio personale e distinto dal cosmo) piuttosto che da considerazioni puramente empiriche

Rispondiamo ora alla terza domanda é servita l'esperienza India alle due personalità musulmane? Che cosa l'India ha dato di comune ai due e che ne ha ricevuto? E' difficile qui dare una risposta decisa E' mia opinione tuttavia che l'esperienza India non molto abbia dato di sostanzialmente nuovo e vitale né a Bīrūnī né a Bābar Forse l'esperienza di *Weltanschauungen* cosí diverse da quella islamica può avere nel primo aumentato e approfondito il senso di tolleranza cosí singolare in lui, ma tolleranza non sempre significa comprensione E, come vedemmo, la tolleranza bīrūniana é spesso basata su un non troppo comprensivo 'buon senso' semplicistico[2] Forse l'esperienza della immensità e della grandiosità della natura dell India potra avere arricchito il già robusto senso della natura di Bābar In complesso, l'esperienza India può aver dato un certo stimolo all'ampliamento degli orizzonti mentali e materiali delle due personalità musulmane cosí come i viaggi dei coraggiosi navigatori musulmani nei mari dell 'India hanno dato l'abbrivo a tutte quelle 'curiosità' *'agā'ib*, all'esotismo ecc ma non si può, credo affermare, che l'esperienza India rappresenti qualcosa di veramente vitale non solo nella personalità di Bīrūnī e di Babar ma anche più in generale in tutta la civiltà

[1] Tuttavia e nell aver dimostrato questo sta il merito principale dello studio sopra citato del Moreno, *anche* i passi più apparentemente 'indù' dei testi sufici rivelano a una meditazione accurata radicali differenze

[2] Ad es quando paragona gli idoli dell'Arabia preislamica a quelli indiani (Bir I—123, 59) L'idolatria indu e l'idolatria semitica hanno a mio parere radici diverse

musulmana[1] in nessun modo l'ipotetico influsso indiano può esser paragonato a quello greco che, lungi dal limitarsi a penetrare nell'esperienza di studio di pochi 'curiosi', ha affondato le sue radici nel piú profondo della mentalità islamica.

Piú forte mi sembra semmai l'indiretto influsso di Bâbar e Bīrūnī sulla cultura e sulla storia indú: figlio di Bābar é l'impero Mogol con tutto il bene e il male che ha portato all'India, figli di Bīrūnī, in senso lato, possono ben dirsi i numerosi tentativi sincretistici indú-musulmani cui abbiamo accennato, e ancor piú alla lontana, il sikhismo, e il teismo indú (bhakti vishnuita ecc.) su tutti i quali già furono studiati influssi islamici.

Due é piú complesso di uno, e l'opera del teismo dinamico islamico sull'elastico e notevolmente assimilatore monismo indú é stata piú facile dell'inversa. Ma la dolorosa scissione attuale dell'India e il sangue che disgraziatamente ne é scorso ci convincono che l'islam non è riuscito a creare, malgrado quasi dieci secoli di permanenza, una unità viva nell'India. Ed é anche questo che, a distanza di secoli, ci conferma nell'opinione che da anti agli occhi di Bīrūnī e di Bābar l'India sia passata come un fantastico sogno, senza riuscire a conquistare e influenzare la zona piú segreta delle loro anime, cosí come Bīrūnī é passato avanti agli occhi dell'Indiani come un curioso dotto *mleccha*[2] che stupiva per la sua cultura (v. Bir. I—23, 12) ma respingeva forse per la sua sicurezza di sé i 'superbi indiani, e Bābar é certo stato odiato da molti indú come un conquistatore e un asservitore.

Non si può negare che se questa scambievole incomprensione dipende anche dal comprensivo esclusivismo indú (mi si perdoni il paradosso) si deve anche attribuirla a certe debolezze della cultura islamica stessa. Il Sarkar[3] non ha fosse tutti i torti quando nel suo studio su Awrangzēb afferma che 'the Mughal Empire did much for India in many ways, but it failed to weld the people into a nation' ed aggiunge, a proposito delle differenze fra indú e musulmani 'the Hindú is solitary, passive, other worldly, his highest aim is self realization, the attainment of personal salvation by individual effort, private devotions and lonely austerities ... the Muslim on the other hand is taught to feel that he is nothing if not a soldier of the militant faith of Islam ... he must pray in congregation ... Islam boldly avows that it is good for us to be here, that God has given the world to the faithful as an inheritance for their enjoyment'.

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[1] Anche Sayyid ḤASAN BARNI nel suo citato studio, mentre loda la ampiezza di vedute e tolleranza di Bīrūnī, riconosce (pag. 218) che Bīrūnī fu relativamente meno famoso nel mondo islamico di altre personalità musulmane, attribuendo questo, a mio parere a torto, a cause unicamente pratiche.

[2] V. Bīr. I. 22 segg., II 12.

[3] JADUNATH SARKAR, *History of Aurangzib*, Calcutta 1924, Vol. V, pag. 479 segg.

Sia Bābar che Bīrūnī appartengono in pieno a *questo* **islam**, sí, anche Bīrūnī, cosī comprensivo e tollerante Egli scrive (Bīr II, 161–280)

> Il loro stato é simile a quello dei cristiani tutto é basato sul principio di far del bene e astenersi dal male, come l'astenersi assolutamente dall'uccidere, sul principio di dare anche la camicia a chi vi ha strappato il vestito, di porgere l'altra guancia a chi vi ha schiaffeggiato su una, di augurare del bene al nemico, e di pregare per lui Questa, in fede mia, é una nobile condotta di vita, ma gli abitanti del mondo non sono tutti filosofi, anzi la maggior parte sono ignoranti e perduti nell'errore, e non si possono tenere sulla retta via altro che con la spada o la frusta, [1]

Tale brano é un riassunto di tutta la mentalità bīrūniana nella sua prima parte ce ne mostra la elevatezza e la comprensività, nella seconda quella praticità semplicistica che ne é il difetto

Mi piace tuttavia terminare questo piccolo omaggio alla grande personalità del filosofo musulmano con una considerazione piú ottimistica, l'augurio cioé che Islamismo e India, teismo e panteismo, il Dio in noi indú e il Dio al di sopra di noi musulmano, che già piú d'una volta in passato tentarono vanamente di accostarsi, possano in futuro trovare non una statica fusione ma una dinamica unità, dopo tanto sangue e tante lotte, in una concezione che senza alcun senso confessionale potrebbe dirsi cristiana, che ha avuto nobilissimi rappresentanti nel sūfismo e nella bhakti e recentemente un grande precursore nella venerabile figura della 'Grande Anima', **M K. Gandhi**

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[1] Anche altrove Bīrūnī ravvicina Cristianesimo e Induismo, v ad es pag II—151, 276

ALBERUNI AND THE RĀMA-KATHĀ

By

C BULCKE, S J

A superficial perusal of *Alberuni's India* sufficiently shows that he was first and foremost a scientist, whose chief interest was astronomy, astrology, cosmology, cosmography, geography, chronometry and alchemy (Rasāyana) Still, his interest was not limited to these scientific subjects, but extended also to religion, philosophy (he translated two books on Sāmkhya and Yoga), sociology and folklore He was too human not to be interested in the whole of Indian civilization, and he can, without fear of contradiction, conclude his book '*We think now that what we have related in this book will be sufficient for any one who wants to converse with the Hindus, and to discuss with them questions of religion, science or literature, on the very basis of their own civilisation*' (II, 246)[1]

It must be admitted, however, that his scientific researches have not left him much leisure for the study of literature In his twelfth chapter *On the Veda, the Purānas and other kinds of national literature*', he mentions the four Vedas, gives a list of 18 Purānas and twenty Smriti books, and also refers to the Mahābhārata and the Harivamśa His information about the Mahābhārata is accurate He knows the reputed author (Vyāsa), the extent (100,000 slokas) and the subject-matter (the war between the children of Pandu and those of Kuru, at Kuruksetra) and further enumerates the names of the eighteen parvans He seems to have had a special predilection for the Bhagavadgīta, which he quotes some fifteen times in the course of his book On the other hand, no mention is made of the Rāmāyana in this chapter, and we look in vain for a reference to Kālidāsa or any other Mahākāvya-poet or dramatist, here or elsewhere in his work The next two chapters treat of literature connected with grammar, prosody and various sciences such as astronomy, astrology and medicine Alberuni himself is conscious of the inadequacy of this survey '*The Hindus cultivate numerous other branches of science and literature, and have a nearly boundless literature I, however, could not comprehend it with my knowledge* (I, 159)

This modest admission, characteristic of the true scholar, should not lead us to the conclusion that Alberuni was totally

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[1] All quotations are taken from *Alberuni's India*, by E C Sachau, 2 vols, London, 1888

ignorant of other literary works Although he does not give any systematic account of the *Rāmāyana*, e g, this does not mean that he did not know a good deal about the contents of the great Indian epic It seems clear, however, that he never read, nor saw, a copy of the Rāmāyana We are forced to conclude this from the way he refers to it '*At that time* (in the Tretā yuga) *Vālmīki composed the story of Rāma and Rāmāyana and eternalised it in his books*' (II, 3), ' *as is described in the story of Rāma and Rāmāyana*' (I, 307), ' *my conjecture is strengthened by the fact that, according to the book of Rāma and Rāmāyana* ' (I, 309) In spite of the fact that he was thus denied first-hand knowledge of the Rāmāyana, it is remarkable how much information concerning the story of Rāma can be gleaned from the pages of *Alberuni's India*

From the passages, quoted above, we see that Alberuni knows that *Vālmīki* was the author of a famous poem dealing with the story of Rāma and that he agrees with the later parts of the epic itself (Bāla- and Uttarakāndas) in making *Vālmīki a contemporary of Rāma* Besides, Alberuni was familiar with the tradition, which places *Rāma in the Tretā yuga* '*The Hindus have several well-known traditions of events which are said to have occurred in the Tretā and Dwāpara yugas, e g the story of Rāma, who killed Rāvana* ' (I, 380) He has, however, to admit that he does not know to what this exactly corresponds '*No doubt, the date of Rāma and Rāmāyana is known among the Hindus but I for my part have not been able to ascertain it*' (II, 3) [1]

Regarding the contents of the Rāma-Katha, we do not find any reference to the early events of Rama's life his birth, marriage and

[1] In ch 49, *A summary description of the eras*, he quotes the Visnu-Dharma 'Mārkandeya says, in answer to a question of Vajra,—I have already lived as long as six kalpas and six manvantaras of the seventh kalpa, 23 Tretāyugas of the 7th manvantara In the 24th Tretāyuga Rāma killed Rāvana, and Laksmana, the brother of Rāma, killed Kumbhakarna The two subjugated the Rāksasas (II, 3)' Dr G Buehler, who has traced the quotations from the Visnu-Dharma (cf Notice on *Alberuni's India*, I A, Vol 19, pp 381-410), says that the Sanskrit text is mutilated Mārkandeya promises to show the differences between the kalpas, and should therefore give two stories about Rāma He gives only one, and so does Alberuni Dr Buehler proposes 'As in the *past* kalpa, when the 6th manvantara had gone in the 24th Tretāyuga of the 7th, then, O King, when Rāma had killed Rāvana together with his host in battle, then that same Rāma slew Kumbhakarna But that holy life of Rāma which happened in the *present* kalpa, O scion of Yadu's race was composed in verse by Vālmīki That which happened in the past kalpa, was narrated O King, by me to Yudhisthira, the son of Dharma, in the Kāmyaka forest' (I, 81, 24-27) In the next chapter of the Visnu-Dharma we find 'Thus in the present kalpa, when the 6th manvantara had gone, in the 24th Tretāyuga of the 7th O King, when Rāma had killed Rāvana together with his host in battle, then Laksmana slew Kumbhakarna O King' (I, 82, 7b-9a) This latter passage is the source of Alberuni's affirmation that Laksmana killed Kumbhakarna and agrees with the Rāmopākhyāna of the Mahābhārata (III, 271, Poona ed.) In the Vālmīki Rāmāyana it is Rāma who kills Kumbhakarna (VI, 67)

banishment to the forest *The cause of the conflict* between Rāma and Rāvana is given in the description of Lankā *There Rāvana, the demon, fortified himself when he had carried off the wife of Rāma, the son of Daśaratha'* (I, 306) The name of neither Hanumān nor Sugrīva is given, but we find a reference to Rāma's *alliance with the monkeys of Kishkindha* in Ch 18 '*Sixteen farsakh*[1] *from Setubandha towards the east is Kishkind, the mountains of the monkeys Every day the king of the monkeys comes out of the thicket together with his hosts, and settles down in particular seats prepared for them The inhabitants of that region prepare for them cooked rice, and bring it to them on leaves After having eaten it they return into the thicket, but in case they are neglected, this would be the ruin of the country as they are not only numerous, but also savage and aggressive According to popular belief, they are a race of men changed into monkeys on account of the help which they had afforded to Rāma when making war on the demons, he is believed to have bequeathed those villages to them as a legacy When a man happens to fall in with them, and he recites to them the poetry of Rāma and pronounces the incantations of Rāma, they will quietly listen to him, they will even lead on the right path him who has gone astray and give him meat and drink At all events, thus the matter stands according to popular belief If there is any truth in this, the effect must be produced by the melody'* (I, 209) The episode of the *Setubandha* is mentioned several times '*Rāma attacked Rāvana after crossing the ocean on a dyke of the length of 100 yojanas, which he had constructed from a mountain in a place called Setubandha, i e bridge of the ocean, east of Ceylon He fought with him and killed him, and Rāma's brother killed the brother of Rāvana, as is described in the story of Rāma and Rāmāyana Thereupon he broke the dyke in ten different places by arrow-shots* (I, 307, cf also I, 209 and 258) *The erection of the Śiva-linga* at Rāmesvaram (Ramsher in Alberuni, I, 209) is not mentioned in the Vālmīki Rāmāyana and is a later development of the Rāma-kathā Alberuni refers to it in his chapter on the beginning of idol-worship '*The Hindus honour their idols on account of those who erected them, not on account of the material of which they are made e g the linga which Rāma erected when he had finished the war with the demons, was of sand, which he had heaped up with his own hand But then it became petrified all at once, since the astrologically correct moment for the erecting of the monument fell before the moment when the workmen had finished the cutting of the stone monument which Rāma originally had ordered'* (I, 121) Alberuni goes on to say that Rāma gave detailed instructions for the building of the temple and the appointment of the priests When dealing with the occupations and customs of the various castes, the author relates *the story of Śambūka* (cf

[1] A farsakh is equal to 4 Arabian miles and about 3 7 English miles

Valm Ram VII, 76) in order to show that nobody is allowed to take to an occupation alien to his caste '*In the days of King Rāma human life was very long, always of a well-defined and well-known length Thus a child never died before his father Then, however, it happened that the son of a Brāhman died while the father was still alive Now the Brāhman brought the child to the door of the king and spoke to him; "This innovation has sprung up in thy days for no other reason but this, that there is something rotten in the state of the country, and because a certain vazir commits in thy realm what he commits" Then Rāma began to inquire into the cause of this, and finally they pointed out to him a Candāla who took the greatest pains in performing worship and in self-torment The king rode to him and found him on the banks of the Ganges, hanging on something with his head downward The king bent his bow, shot at him, and pierced his bowels Then he spoke "That it is! I kill thee on account of a good action which thou art not allowed to do" When he returned home, he found the son of the Brāhman, who had been deposited before his door, alive*' (II, 137)

In Chapter 46, *On Nārāyana, his appearance at different times, and his names*, mention is made of *Rāma as an Avatāra of Visnu* '. *in Tretāyuga, in the shape of Rāma alone for the purpose of spreading fortitude, to conquer the bad, and to preserve the three worlds by force and prevalence of virtuous action*' (I, 397) Finally we find a quotation from Varāhamihira, referring to the size of *the image of Rāma If the figure is made to represent Rāma the son of Daśaratha, or Bāli the son of Virocana, give it the height of 120 digits*' (I, 117)

In the 30th Chapter, *On Lankā, or the Cupola of the earth*[1] Alberuni says that the descriptions of Lankā given by the Hindus do not agree and that no sailor who has traversed the ocean in that region has ever given an account which tallies with the traditions of the Hindus He, then, advances his own theory and identifies Lanka with the clove-country Langa (whence the word *Lavang* for clove), or the island of Langabalus of the Arabs, which, according to modern research, corresponds to the Nicobar Islands[2]

We may still add that mention is made of the expression *Rāvanaśiras* to denote the number *ten* and thus we have gathered all the material referring to the Rāma-Kathā, which is to be found in Alberuni's India Although the picture is far from complete, it must be admitted that we cannot, with any degree of justification, apply to him the popular description of an ignoramus 'After all his studies he does not even know who Rāma is and who Rāvana is'

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[1] Cupola of the world ' the midst of the inhabitable world, a metaphorical term to denote a point from which the two ends of the inhabitable world in east and west are equidistant and without latitude' (I, 306)

[2] Cf A Sprenger, Post-und Reiserouten des Orients, p 88, quoted by E C Sachau

In any case he could have taught a lot of things about Rāma to the other Arab travellers to India,[1] and to many travellers of modern times too, beginning with William Finch (1608–11) who, in his description of Oude, writes[2] 'Here are also the ruins of Ranichands castle and houses, which the Indians acknowledge for the great God, saying that he took flesh upon him to see the tamasha of the world'

[1] Alberuni's predecessors Sulaymān (851 A D), Abu Dulal Misar (940 A D) and Mas'ūdī (943) have not a word about the Rāma-story, although the first made several journeys to India and mentions Sirandib (Ceylon) and the Langabalus Islands Ibn Batūṭa (First half of 14th cent) mentions the existence of numerous black monkeys with long tails in Ceylon, but does not make any reference to the Rāma story Cf G Ferrand, Relation de Voyages, Paris, 1913 and Voyages d'Ibn Batoutah (IV, 175), Paris 1922

[2] Cf *Early Travels in India*, Oxford Un Press, 1922

AL-BĪRŪNĪ AND SANSKRIT

By

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Abū-Rayḥān Muhammad Ibn Ahmad Al-Bīrūnī, or Al-Bērōnī, who was born in 973 'in the territory of Khiva, then called Khwārizm, or Chorasmia in antiquity', and who died, probably at Ghazna, in 1048 is distinguished as one of the greatest scholars of medieval times, a polymath who was equally at home in mathematics and theology, astronomy and philosophy, chemistry and chronology, history and ethnography, and medicine and cosmography, and whose special pre-eminence was that he was the first of scientific Indologists and one of the greatest of all times From his vast and exact scholarship on the one hand, and his broad liberalism and objectivism on the other, Al-Bīrūnī has to be reckoned among the outstanding thought-leaders of humanity The unique character and importance of his scholarship and of his personality was fully understood and appreciated by the editor of two of his greatest works, the German scholar Edward Sachau, to whom the modern world has to be specially grateful for his edition of the Arabic text of his *Indica* (London, 1887) and for his English translation of that book (London, 1888) Sachau's glowing tribute to the actual achievement of the scholar and the man, a tribute which is fully his due and which is all the more effective because of its quiet reticence, and, above all, the sterling worth of his work, have helped to establish Al Bīrūnī s position he should, however, be better known particularly in India, whose first scientific interpreter he became It looks as if Al-Bīrūnī will finally come to his own for now, 900 years after his death, his memory is being revived by the scholarly world in Europe and India an Al-Bīrūnī Millenary has been held in Paris on the occasion of the 21st International Congress of Orientalists (July 1948), and Al-Bīrūnī celebrations are going to be held in Calcutta under the auspices of the Iran Society in December 1948 [1]

Although the scholarship of Al-Bīrūnī is both deep and wide it is not his sole or main claim to our gratitude He was something more than a scholar—he was a just man, whose own special religious convictions did not allow him to belittle or minimize the achievements of another people who had developed in a different *milieu* His mind was singularly free from the narrow religious outlook of an

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[1] Because of special circumstances the Al-Bīrūnī celebrations had to be postponed to a later date

orthodox scriptural religion, which sees the supreme truth only in itself, and is not usually favourable to a sympathetic study and understanding of other faiths as being equally paths in the same quest Although the full title of his work on India gives the point of view of an orthodox *Muslim* man of science, viz 'An accurate description of all categories of Hindu thought, as well those which are admissible as those which must be rejected' (*Kitāb fī tahqīq mā-l-Hind min maqūla muqabūla fī-l-'aql aw i mirdhula*), yet it is not polemical or propagandistic with the intention of establishing the superiority of one point of view over another He takes it for granted, tacitly and explicitly, as a good Muslim and a scholar from outside who had an easily understandable sense of superiority over the Hindus who were giving way to the Muslim Turks in the battle of life, that his Islamic *milieu* was on a higher plane than the Hindu one as being more cosmopolitan and more reasonable Yet he seeks to hold the balance even Things and notions, practices and ideas current in the Hindu world, which did not have his approval as a man of science and as a man of common sense, he did not look upon as being just 'beastly devices of the heathen' He manifests a clear anxiety to show that in these matters the Hindus were just human, and he quotes parallel situations from other parts of the world—that of the ancient Greeks, or the early Arabs, for instance In this way he seeks to do away with any repugnance which the Muslim readers of his Arabic work might feel specially for the people of India This detachment, or aloofness, or disinterestedness of science, without any *parti pris* through theological or racial bias, is a thing for which we Hindus of India should feel specially grateful to Al-Bīrūnī, and for which the scientific world will also be thankful to his memory This attitude is certainly more precious than positive scholarship, humanly speaking

Al-Bīrūnī was a scholar of a unique breadth of vision in his day Probably, when he was in the prime of his intellectual life, say, about 1040 A D, more than 900 years ago from now, he was the most erudite and the most cosmopolitan or international scholar in the whole world In China and India, the greatest scholars had their vision limited to the worlds of China and India only There was no one in these countries who had the least notion of the great cultures of the West—of the Islamic world, of ancient Greece and Rome In Western Europe, including Italy, it was the dark age, when a little Christian knowledge through Latin, with some of the Latin classical writers who were a little studied by the more ardent scholars, was all that was available to the scholarly world The Byzantine scholars of Eastern Europe similarly had no knowledge of the literature or culture of the Saracens, and it was only where Saracenic dominion was well established that internationalism in scholarship was coming into being But in Al-Bīrūnī we have a

man who probably spoke Persian as his mother-tongue, but belonging as he did to a Turki-speaking country, Khwārizm, and living in the entourage of a Turki aristocracy in Ghazna, he must have been familiar with Turki and as a scholar of his inquisitiveness and interest, whatever was available as literature in these languages he can be expected to be cognizant of Arabic was both the religious and culture-language of the Islamic world, and this he knew perfectly, at least as well as (if not much better than) the best Indian writer of English knowing the latter language A good deal of the knowledge and science of the Greek and Byzantine as well as Syrian worlds, and a considerable amount of Indian science in mathematics and astronomy as well as medicine, he had access to through Arabic translations, for in early Islamic times Arabic in Baghdad became a sort of inheritor of the accumulated earlier knowledge of the more ancient neighbouring civilizations Al-Bīrunī quotes from Plato and Aristotle, with whom he was familiar through Arabic translations, made second-hand from intermediate Syrian versions but he understood their value and implication, historical as well as philosophical and scientific He quotes from Kapila and Vyāsa, from Varāha-mihira and the Purānas, with equal facility and understanding and what is more, he knew the original language of these Indian writers—a unique thing among his own people A man equally at home with so many distinct cultural domains—the Indian, the Islamic (including Arabic, Iranian and 'Turanian' or Turki), the Hellenic (although the latter was only second-hand)—and about the year 1040 A D so far as we know, there was only one such man in the civilized world, and that man was Al-Bīrūnī

The monarch under whose umbrage Al-Bīrūnī lived from 1017 onwards, from his 44th year to his 58th, the great Sultān Mahmūd of Ghazna, did not become, owing to the force of political circumstances, the enlightened patron for our scholar which otherwise he might have been The circumstances have been fully indicated by Sachau He was a hostage in the court of Mahmūd from an erstwhile hostile state, respected, undoubtedly, for his scholarly attainments, but not properly helped or patronized Sultān Mahmūd of Ghazna was a powerful ruler, and he was actuated by both a sincere religious zeal combined with a strong desire for plunder in undertaking a series of raids into India, in the course of which he did the greatest harm to his Hindu neighbours, killing and enslaving thousands, destroying towns, temples and images and carrying off loot worth millions These raids were not conducive to create a favourable opinion in the mind of the Hindu people for Mahmūd and his Turks, and the name of the *Turk* naturally came to be both dreaded and hated among Hindus In 921, Mahmūd annexed the Indian province of the Panjab to his empire of Ghazna, and, under a Muslim sovereign, although inhabited by Hindus (among whom proselytization started

immediately), the Panjab became 'a land of peace', where a Muslim, a scholar as much as a soldier, could move about without danger or difficulty This certainly gave to Al-Bīrūnī his great opportunity to study Hindu culture first-hand, by coming into India and sojourning there Previously he was, as an astronomer and mathematician, interested in Hindu works on these sciences which were available to him in Arabic versions His enforced stay at Ghazna as a hostage from Khwārizm from 1017 probably gave him his first chance to know first-hand something of Hindu learning Ghazna, as the seat of the greatest Islamic state of the East and as the capital of a powerful and efficient ruler like Mahmūd, had undoubtedly attracted people from all parts of the Near East and from Central Asia, and India was not unrepresented in its cosmopolitan population Indian soldiers and artisans, princes and learned men were there as prisoners of war, most of whom were perhaps destined never to return to India or to be accepted in the fold of their own society even if they could return to India, as their captivity among the impure foreign barbarians, the Turks, had polluted them beyond redemption in the eyes of the generality of their intellectually and spiritually degraded kinsmen who by accident or through distance had escaped a similar fate to their own Then there were the settled Hindu people of Afghanistan who were not yet wholly cut off from the bases of their national literature and culture It would appear that both these sets of people had intelligent men who could appreciate the interest shown in their religion and ways of thinking by a member of the ruling race who was evidently generally esteemed for his learning Al-Bīrūnī's serious study of Indian things, including Sanskrit, and the West Panjab vernacular speech (which was also evidently current among the Hindus of Afghanistan) in all likelihood began in Ghazna With the establishment of Turki rule in the Panjab he would appear to have paid some visits to places in Western Panjab, where he met Brahman and other scholars to help him, and to have stayed for some time in Multan, which was still a very sacred place of Hindu pilgrimage with its temple of the Sun-god where Sanskrit learning might be expected to flourish during the first half of the tenth century

Sachau has given his opinion about the nature of Al-Bīrūnī's Sanskrit scholarship It was wide enough and practical, but not very profound and for a good deal of it, Al-Bīrūnī, like most European Sanskritists who worked in India from the days of Charles Wilkinson and William Jones, was indebted to 'the Sastri or Pandit at his elbow' There were perhaps several of these Brahman assistants or collaborators on whom at different times Al-Bīrūnī had to rely for his scientific work These men served him by giving running translations of texts in which he was interested, in some language which both sides understood—either (as can normally be

expected) the West Panjab vernacular which Al-Bīrūnī must have picked up as one of the languages of Ghazna, or (what is equally likely) Persian This was the basis of his Sanskrit scholarship He probably read a lot of Sanskrit by himself after acquiring an elementary knowledge of it with the help of these translations or paraphrases which he took down for his own use after rendering them into Persian or Arabic He was instrumental in translating and composing some works into Sanskrit, and here too the Sanskrit Pandit was in evidence, in rendering into Sanskrit verse the subject-matter explained to them by him Sachau has made a most brilliant study of Al-Bīrūnī's attainments in Sanskrit—his actual achievements and his limitations—by comparing his translations into Arabic with the original Sanskrit texts—and it has been no small feat for this great German scholar who combined in himself in a unique way the Arabicist and the Sanskritist

A certain amount of Sanskrit literature appears to have been translated into Pahlavi (and from Pahlavi into the languages of the West—Syriac and Arabic and Greek) from Sasanian times, and the Arabic translations of Sanskrit works on mathematics astronomy and medicine, as well as on philosophy made in Baghdad during the rule of the early Abbasids, were in the line of the tradition of these Sasanian translations As a matter of fact, this tradition goes back earlier, to Greek times From the fifth century B C at least, Indian scholars and religious men, with the spirit of *Wander-lust* and adventure in them (their tribe has continued to our day) were in the habit of going to the West, at least as far as Greece, coming in contact with appreciative spirits abroad and bringing to them their own point of view in matters metaphysical We have record of at least one such Indian philosopher reaching Athens and meeting Socrates, before 400 B C Alexander took Calanos with him from India as far as Babylon where the latter committed suicide by burning himself on the pyre Asoka in the third century B C sent Buddhist philosophers to the lands of the Near East -Asia Minor Syria, Egypt, Greece Doubtless there were others who were not formally Buddhists These men might have given oral lectures on Indian philosophy which formed the basis of what meagre information the Greek and Syrian world received about the Indian world of ideas It is not known whether they translated any Sanskrit or other Indian work in a Western speech, Old Persian, or Syriac, or Greek no such work has survived, nor is there any clear reference to any such work From the sixth century A D when the strong Sasanian empire in Iran had cultural rapprochements with the contemporary Indian empires of the Guptas in North India and of the Chalukyas in the Deccan a systematic effort at translation of Indian works into Iranian was inaugurated A great and a puissant empire like that of the Sasanians could not be without a literary renaissance

in Iran, and about the same time Greek and Syriac works on science (medicine and astronomy) and philosophy began to be rendered into Persian, and similarly works from the Sanskrit Greek sophists, philosophers or scholars (*pat hrōm filisōkfāy*, as the Pahlavi Denkart has it), carrying with them both the lore of classical Hellas and of Byzantine or Romaic Greece (*Yonāyīk* and *Hromāyīk* respectively as the Sasanian Iranians distinguished them), came to Iran and enriched both the Iranian mind and Iranian literature by their teaching and their translations Indian wise men (*pat hindūkān dānāk*) similarly found the court of the Sasanian monarchs appreciative of their talents and their science and thought, and we are told that a number of books were rendered into Iranian (Pahlavi), including *trk'*, i e *tarka* or Logic (See H W Bailey 'Zoroastrian Problems in Ninth-century Books—Ratanbai Katrak Lectures' Oxford, 1943, pp 80–86) The Indian scholars who were in the habit of coming to Iran did not find themselves in an uncongenial atmosphere Iranian Zoroastrianism with its fire ritual was something they could understand In the Sasanian period, Hindu notions about ceremonial purity, about *Ārya* and *Mleccha*, about caste and pollution, were not yet so rigid as in later post-Mohammedan times, and it is just likely that scholars would go to Iran and come back to their own society in Hindu India without any loss of caste Undoubtedly it was like that in pre-Christian Greek times But with an intransigent creed like Islam, the followers of which lacked that spirit of compromise towards the faith and usages of *Kāfirs* which the Greeks and Iranians would show to creeds different from theirs, the situation became different The thin stream of Sanskrit-knowing scholars who went to Baghdad seemed to have settled there for good, and we hear of conversions of some of them to Islam, which suggests that after a sojourn in an Islamic country they found it impossible to be accommodated in their own society at a time when Hindu India was in the throes of a life-and-death struggle with Islam in the north-west frontier of India It was consequently the proximity of Ghazna to India, and the fact that at Ghazna an enquiring spirit like Al-Bīrūnī's could find suitable persons to initiate him into Hindu lore through the vernacular of Western Panjab, and even, it may be, through Sanskrit that brought about the happy circumstance of the great Iranian scholar being enabled, Muslim though he was and as such the object of natural suspicion among Hindus, to enter into the doubly closed precincts of Hindu science and philosophy

Al-Bīrūnī nowhere mentions *Sanskrit* by name, nor has he ever employed the words *Prakrit* or *Apabhraṃśa* But he was quite in line with the view-point (which was that of early medieval India and which was current among the orthodox or old-fashioned Sanskrit scholars to our day) that Sanskrit and the spoken vernacular (or vernaculars) were not so much as distinct languages as two different

styles of a single speech. It was mainly a matter of phonetic equivalences, with a slight modicum of inflexional and glossic changes, and Sanskrit became the spoken vernacular and *vice versa* Such was for instance the opinion of Dāmodara, the author of the *Ukti-vyakti-prakarana*, a work composed probably at Benares within a hundred years of the death of Al-Bīrūnī with a view to teaching Sanskrit through the vernacular 'like a debased Brahman woman who has performed the expiation ceremony and is restored to her original status of a Brahman lady', by restoring the fuller forms the current Apabhramśa speech is turned into good Sanskrit As in contemporary Indian usage, the line of demarcation between the correct Sanskrit of books and the vernacular forms is not strictly maintained by Al Bīrūnī At times he gives Prakritic or vernacular forms in place of, or side by side with, Sanskrit forms And in the matter of pronunciation, he is not consistent—he pronounced a Sanskrit letter sometimes in one way sometimes in another This want of consistency is perhaps due to his not finding a single or uniform pronunciation among his Sanskrit-knowing collaborators or teachers They might have been, as Sachau has already suggested, men from different parts of India

And from what parts of India were they mostly? Sachau has given a list of all the Sanskrit and other Indian words as employed by Al-Bīrūnī in his book, in their original Perso-Arabic transcriptions and their Sanskrit equivalents or source-forms A study of this list, taking due note of the imperfections of the Kufic Arabic script employed by Al-Bīrūnī for his Arabic is very valuable for finding out the nature of both the pronunciation of Sanskrit (in some of its local forms) and the phonology of Early New Indo-Aryan (particularly of Western Panjab) in the eleventh century

Al-Bīrūnī's transcriptions[1] indicate a diversity of pronunciation The bulk of his forms would show that these are not based on what we would expect to be a Western Panjab pronunciation, or a Ganges Valley pronunciation, of about 1000 A D, but would rather appear to be what may be called a *spelling pronunciation*, with some noteworthy Ganges Valley characteristics which a person familiar with the Sanskrit script and the accepted values of the letters as given in the grammars and not at home in the oral traditions or forms would follow in his transliteration In all, not more than 2,500 Sanskrit words have been given by Al-Bīrūnī in transcription in his work These transcriptions suffer in two ways They were

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[1] In the transcriptions made into the Roman script of the Sanskrit words as written with the Arabic letters by Al-Bīrūnī for comparative study with the original Sanskrit forms, the following equivalents have been used

ʼ = ا, θ = ث, ǰ = ج, c = چ, ḥ = ح, x = خ, δ = ذ, ž = ژ, š = ش, ṣ ḍ = ص, ض, ṭ ẓ = ط, ظ, ʿ = ع

written in the Kufi style of Arabic which was then in vogue, and then, the MS Schefer, which is a transcript of Al-Bīrūnī's autograph MS made in 1159 (Al-Bīrūnī having completed his work early in 1031), made mistakes in copying the unfamiliar Sanskrit words which could be put into the Kufic Arabic script only most imperfectly The *nuqtas* or points marking the difference between a *b*, a *t*, and a *p*, or between a *c*, a *j*, a *kh* and an *h*, between a *d* and a *dh* (spirant), between *s* and *sh*, were not yet the rule but rather exception in Arabic writing of the time of Al-Bīrūnī and although he takes care to indicate them, as the evidence of the Schefer MS copied from his original autograph would testify, and he sometimes uses the Persian three-dotted letter for *c* and for *p* and a *kāf* (*k*) with two dots above for *g* (the later Persian form of the letter *gāf* was as yet not in existence), Al-Bīrūnī appears to have been rather careless in his transliteration for *p*, *c*, *t*, *g*, and does not trouble much about the Indian aspirates *kh*, *gh*, *th*, *dh* *ph*, *bh*, etc He, however, uses frequently enough the Perso-Arabic letter *dhāl* (for a spirant sound in these two speeches, like that of English *th* as in *then*, *bathe*) for the Sanskrit and Indian aspirated stop *dh* (= *d-h*) The cerebral or retroflex sounds of Indian languages of course Al-Bīrūnī did not know how to represent with the help of Arabic letters, and he was content to use the ordinary Arabic dentals *t*, *d* for them, and *r* for interior *d* when it was pronounced as *r* (e g *krv* = *kudava*, *by'ry* = *Vyādi*, *drwr* = *Dravida*, *drmr* = *Dramida*, *n'ry* = *nādī*, *byrwrj* = *vaidurya*, etc) But he was conscious of the special character of the Indian cerebral *n* which is a living sound not only in Panjabi (both Western and Eastern) and in Sindhi but also in Pashto, and he occasionally attempted to denote it by the combination *nr* or *rn* (as in *p'nrn* = *Pānini* written *p'nrl*, and *brnj* = *banij* or *vanij*, and a Prakritic or vernacular pronunciation has been followed in the case of the word *bhānu*, when it has been written once as *bh'n* and again as *bh'r* = *bhānu*, besides *bh'n*, *bh'nw* = *bhānu*) The vocalism of these Sanskrit words was sought to be rendered only in a half-hearted way, and the copyist has degraded the transcription further by making confusions e g using a *sukūn* for a *damma* (e g writing *bār* for *bāru*)

A few observations may be made about the pronunciation of Sanskrit which Al-Bīrūnī has generally followed in his transcriptions He has almost always used *b*- -*b*- for *v* of Sanskrit, never *w* = *v* initially, and rarely *w* when it is pre- or post-consonantal or intervocal Post-consonantal *v* is omitted frequently enough, indicated a vernacularized pronunciation with post-consonantal *v* serving only to double or lengthen the preceding consonant (e g ***blnb*** = ***vilambin***, *'bykt* = *avyakta*, *blbh* = *Valabhī*, *prd* for *brd* = *vṛddhi*, ***prk*** for ***brk*** = *vṛka*, *brn* = *varna* and *Varuna*, *bdš* = *Vidiśā*, *b'lmyk* = ***Vālmīki***, ***b'mn*** = ***Vāmana***, *b'ndw* = *Pāṇḍava*, ***plb*** = ***plava***, ***byn*** =

byd-by'as = *Veda-vyāsa*, *t'mrbrn* = *tāmravarna*, but *šwyt* = *švēta* and *bywswt* = *Vaivasvata*, while *dršdbd* = *Drṣadvatī*, *rb* = *ravi*, *k'b* = *kāvya*, etc) In an attempt to represent the post-consonantal *v*, we have transcriptions like *sršft* = *sarasvatī*, beside *srst* = **sarassatī*, *bvšf'nr* = *vaiśvānara*, and *nndkšyfr* for *nndkyšfr* = *Nandikeśvara*, with *f* = Skt *v* It is interesting to note that *v* after a sibilant in all likelihood became unvoiced to *f* evidently in the West Panjab pronunciation of Sanskrit in the 11th century—**Sarasfatī*, **Vaiśfārara*, **Nandikeśfara* The West Panjab and Sindh pronunciations whether of the local Prakritic vernaculars or of Sanskrit, has preserved initial *v* (and interior *v* where it was not frankly assimilated with the preceding consonant in the Prakritic words) as *w* Use of *b* for initial and interior *v* characterized the pronunciation of the Gangetic Valley Did Al-Bīrūnī consciously adopt the pronuncia-tion of the Pandits of interior India, as it might appear to him as having preserved a purer tradition, in the case of the Sanskrit *v*? For *v* a form ڤ, now revived in Egypt for the European *v*, is found in a few cases e g ميڤار = *mewār*

In medieval India, when exactly we do not know, but it was probably when Apabhramśa as a literary language was fully estab-lished (say, after 800 A D) over the greater part of Northern India, from the Panjab to Bengal, the Sanskrit *s* developed the value of *kh*, both in isolation and combination so much so that the letter for *s* ष in Early Hindi orthography, was commonly used for ख = *kh* and in the Gurmukhi script, ष became the regular sign for *kh* in place of ख That is why in the seventeenth century Dara Shikoh transcribed *Upanisad* as *bnkht* = *Upanikhat* in his Persian translation of the Upanisads But Al Bīrūnī, except in a very few cases where he used خ (x) and ک (*k*) for ष = *kh* for *s* (e g in the case of the word *škht* = *sisyahita* pron **sikhyahita*, and *nxδi* = *nikhadha* = *nisadha* beside *nšδ*, *'šrvxyn* = *Śrīsena* *ghwk* = *ghosa* *bxw* = *visuva*, cf also *pxkl'wat* = *Puskalāvatī*, *pxkr* = *Puskara* (?)), always writes *š* for *s* This would indicate a conscious attempt to give the letter ष its proper or original value of a sibilant So, too, in the case of the palatal *ś* This in the medieval tradition of Sanskrit pronunciation became a dental *s* But Al-Bīrūnī is equally careful to represent it almost always by *š* being thus at pains to show its difference from the dental *s* This *kh* pronunciation of *s*, and *s* pronunciation of *ś* is of course in *tatsama* and *semi-tatsama*, i e borrowed Sanskrit words unmodified or modified and not in *tadbhava* i e derived, Prakritic words (These latter turned original *ś s s* to *s* in the Ganges Valley but to *h* in the Panjab and Sindh e g Skt *vimśati* *vimśa* = Hindi *bīs*, but Panjabi *wīh*, Skt *deśa* = Hindi *des*, Sindhi *dehu*, Skt *snuṣā* = Panjabi *nuh*, Skt *āṣāḍha* = Hindi *asāṛh*, Panjabi *hāṛ*, Skt *trāsa* = Panjabi *trāh*, etc)

Examples of *š* for both *ś* and *ṣ* of Sanskrit in Al-Bīrūnī *k'šy* = *Kāśī*, *k'yšb* for *k'śyb* = *Kāśyapa*, *tš* = *Tiṣya*, *bbš*, *bhbš* = *bhaviṣya*, *bh'rθbrš* = *Bhārata-* (pron *bhāratha-*) *varṣa*; *kšyr* = *kṣīra*, *kšknḍ* = *Kiṣkindhyā*, *kš* = *kuśa*, *k'št* = *kāṣṭhā*, *šnk* = *śankha*, *šntn* = *Śāntanu*, *šyš* = *śeṣa*, *šyl-st'pt* = *Śailasutāpati*, *škt* = *śakti*, *ššlkš* = *śaśilakṣa*, *šš* = *śiṣya*, *šstr* = *śastra*, *šq* = *Śaka*, *škrb'r* = *Śukravāra*, *š* = *iṣu*, *āśā*, *šr'bn* = *Śrāvaṇa*, *šrw* = *śarabha*, *šj* = *śuci*, etc In *tkršl* = *Takṣaśilā*, *pywrn* = *Payoṣṇī*, *'rt* = *aṣṭa*, *m'nsrtg* = *māṃsāṣṭaka*, *pwr'rtk* = *pūrāṣṭaka*, we have curiously enough *r* for *š* is this *r* due to a voiced pronunciation of the *ṣ* in combination, as *z*, which could be confused with *r*? There are cases, however, where س = *s* has been used for *ś* and *ṣ* the reason for this has been noted by Sachau in the Introduction to his edition of Al-Bīrūnī's Arabic text

(In a word like *mxrb* = *mikharva*, *x* has been used for the Sanskrit *kh*)

Parallel to the *b*-pronunciation of Sanskrit *v* is the *j*-pronunciation of Sanskrit *y*, single or in a nexus This vernacular habit which is fairly ancient, is followed by Al-Bīrūnī in his transliterations Thus *jbn*, *j'wn* = *Yavana*, *j'njblk* = *Yājñavalkya*, *j m* = *yāmya*, *j dw* = *Yādava*, *'rj'prt*, *'rj'vrt* (ارجاورت) = *Āryāvarta* *jθštr* = *Yudhiṣṭhira*, *jm* = *Yama*, *'jwdhh* = *Ayodhyā*, *jnjw'*, *jnjw'* = **jañjoī* = *yajñopavīta*, *'rjbhr* = *Āryabhaṭa* pron *Ārjabhada*, *'rjk* = *Āryaka* *rjm* = *Aryaman*, *jwšn* = *yojana*, *'jrd'* = *āyurdā*, *jwg* = *yuga*, *'j'rj* = *ācārya*, *njwt* = *niyuta* (also *nywtn*), *p'rz'tr* = *Pāriyātra*, *srjw* = *Sarayū*, beside *srw* = **Saravū*, *srj't* = *Śaryāti* Cf *sj* = *Sahya*, with Prakritic assimilation as *Sajjha*

Al-Bīrūnī evidently knew, but ignored as colloquial or vulgar the *gy* pronunciation of Sanskrit *jñ* which is current all over Northern India and spread even into the South He wrote *yajña* as *jgm**, *Yājñavalkya* as both *j'njblk* and as *j'gbnlk*, and generally he employed *nj* for *jn*, and in one case *šn* for *jñ*—*šnh* = *jña* The use of *d* for *t* is also common enough e g *mds* beside *mts* = *matsya*, besides a vernacularized *mj* for *mc* = *maccha*, *'dr* = *Atri*, *adri*, beside *'tr* = *Atri*, *'dby* = *ātavya*, *bds* = *vatsa*, etc

The above are some of the salient characteristics of Al-Bīrūnī's method of writing Sanskrit words in the Perso-Arabic (Kufic) writing of his day There are a number of other points, which can be easily explained by taking note of both Indian speech habits and the Perso-Arabic graphic system For a study of Indo-Aryan phonology round about 1000 A D, when the New Indo-Aryan vernaculars were coming into being and when a medieval tradition in Sanskrit pronunciation was already established (the ancient Sanskrit pronunciation as in Old Indo-Aryan, i e Vedic times, being transformed in the course of the development of Middle Indo-Aryan and so lost to

the people), Al-Bīrūnī's transcriptions, in spite of the limitations of the Perso-Arabic script and the carelessness or want of system of Al-Bīrūnī himself and the defects or mistakes of the copyist, still have a great value (Cf in this connexion, Suniti Kumar Chatterji, 'Sanskrit in Perso-Arabic Script. A side-light on the Medieval Pronunciation of Sanskrit in Kashmir and Northern India', in *Indian Linguistics* (Quarterly Bulletin of the Linguistic Society of India), Vol VII, Part 3, 1939, Calcutta, pp 131–166)

Al-Bīrūnī noted that the speech of the Hindus in their daily life differed from that of the written literature—that is, Prakrit and Apabhramśa or Bhāṣā (which to him were identical) on the one hand and Sanskrit on the other presented two different strata Of the former he knew only one—the speech of Western Panjab and of Afghanistan Hindus, which were probably identical in his time and was very similar to the speech of Sindh Evidently he had no notion of other Prakritic speeches of interior India, and Hindu sojourners or prisoners in Ghazna from interior India (i e the Western and Eastern Hindi areas) would, as things would tend to show, familiarly employ the Western Panjab speech, which was not much different from spoken Western Apabhramśa with which Midlanders and Easterners were familiar as a great inter-provincial literary vernacular, the precursor of Braj-bhākhā and Hindi or Hindustani (Hindusthani) Al-Bīrūnī consciously or unconsciously has given a good number of these North-Western Indian vernacular words in his book, in place of the expected Sanskrit, and from these, we can form some idea of at least the phonology and phonetic habits of this vernacular It was a dialect which changed interior (and frequently initial) s of Prakrit (< Skt ś ṣ s) to *h* e g *krwh* = *kroha* = Skt *krośa*, *by'h* = *Biyāha* = *Biāha* for *Wiwāha* = *Vipāśā*, *āh'ry* = *āhārī* < *āṣādha-*, *bhnd* = *bahanda* for **Wahunda* = *Vasanta*, *lwh'wr* = *Śālātura* *dhyn* = *dahī* = *daśamikā*, *y'hy* = *yāhī* = *eāhī* < **eāahī* = *ekādasikā*, *dw'hy* = *duwahī* < *dvādasikā*, so *trwhy*, *cudhy*, *pnc'hy* > *trayodaśikā*, *caturdaśikā*, *pañcadaśikā* In this dialect, also the Old Indo-Aryan nasal + surd stop or aspirate became nasal + sonant stop or aspirate and nasal + sonant stop or aspirate became double nasal e g *s'ng* = **sāng(h)a* for *sānkhya*, *bhnd* = *Vasanta*, changed in pronunciation to *Wahundu*, in all likelihood, *s'mnd* = *Sāmanta*, *trnj'y* = *tribañcāśikā* (**trivanjāhi*) and *dwm* = **domma* = Skt *domba*, *'dnpr* = **Uddanna-puri* = *Uddandapurī* Cf with the above the Modern Panjabi forms *dand* = Skt *danta*, *cambā* = Skt *campaka*, *cannan* = *candana*, Sindhi *kāndo* = *kantaka*, etc and in the Arabic version of the *Mahābhārata* story made before 1000 A D, which was rendered into Persian and abridged, and published in this abridged Persian version by Reinaud from Paris in 1845, we have similarly *qnd* = *Kuntī*, **Kundi* and *fn* = *fnn* < *Pannu* = *Pāṇḍu* Cf also Panjabi *Canāb* = *Cannahā* < *Candrabhāgā*, *Candahāā* + Persian *āb* This dialect also preserved

unassimilated initial groups like *kr*, *tr* (e g *krwh* = *kroha* = *krośa*, *tryh* = *triya* = *tritīya* (> **triīya*).

A study of the vernacular words or forms, apart from the professedly Sanskrit ones, in Al-Bīrūnī's *Indica* consequently has some useful sidelight to throw on the history of the sounds in Panjabi and Sindhi and this matter, in conjunction with similar contemporary transcriptions of North-Western names and words in Persian and Arabic writers, should be taken in hand for detailed study

Al-Bīrūnī made translations from Sanskrit into Arabic, the works he is known to have translated, and the method employed by him in this work, have been indicated by Sachau He on his own showing made (or got made with the help of his Pandit assistants) translations of some Arabic works into Sanskrit Sachau has discussed this (§5, Introduction to the Arabic text of the *Indica*) His works on Indological subjects including translations from Sanskrit are mentioned by Sachau, apart from his great work, the *Indica* (pp xx, xxi, Introduction) He made Sanskrit versions of at least three works—Euclid's Elements, Ptolemy's Almagest and a work of his own on the astrolabe as Sachau says, 'Probably he dictated the meanings to his Pandits and they moulded the words into Slokas' He appears to have been in touch with Hindu scholars in Kashmir and interior India through these Sanskrit versions of Arabic and Islamic science But unfortunately all trace of his Sanskrit translations is lost

In outwardly a very small but very highly significant matter, it seems we can see Al-Bīrūnī in the *rôle* of a translator into Sanskrit, and as a lover of India and Indian culture, and at the same time a practical supporter of the principle of self-determination among peoples

After the conquest of Khiva in 1017 by Sultān Mahmūd of Ghazna, Al-Bīrūnī was compelled to remain in Ghazna as a hostage, and he appears to have been treated with respect for his learning if not actually patronized with royal favour and largesse and facilities for study and research In any case, Al-Bīrūnī had no reason to feel specially grateful to his illustrious contemporary, and on the other hand, he complained about the difficulties by way of leisure and funds in carrying on his work Mahmūd of Ghazna had another great man in his court, the poet Firdausī, who wrote his *magnum opus*, the national epic of Persia, the *Shāh-nāmā*, with hopes of adequate recompense, but who was bitterly disappointed at the end of his labours The want of sympathy and the opposition of the chief adviser of Mahmūd was largely responsible for Mahmūd's neglect of these two of the greatest men of his times who were actually in his entourage, viz Al-Bīrūnī and Firdausī

Maḥmūd was an efficient ruler, generous and chivalrous, and a great patron of the arts and sciences He lived in what may be

called the second epoch in the heroic age of both Islam and of Turkdom, and his advocacy of and propagation of Islam in India was actuated by both high motives of religion, such as he understood religion to be, and lust for easy plunder Like the Frankish Crusaders of a century later, he had not the slightest doubt that he and his Turki warriors were among the elect of God, the chosen knights of Allah, who in fighting and killing, plundering and converting the Hindus and in destroying the abominations of their temples and idols were but working the will of God, and for this service to Allah and Islam they were rewarded with the accumulated treasures of India and slaves from India in this world, and had the assurance of the joys of paradise as their reward in the next With those motives, he with his strongly organized Turks and their associates, burning with the zeal of Islamic faith, and eager for *Lebensraum* as a ruling power, was enabled among the disunited, isolated and decadent Hindus with their antiquated methods of fighting to perform, in the words of Al-Bīrūnī himself, 'wonderful exploits, by which the Hindus became like atoms of dust scattered in all directions, and like a tale of old in the mouth of the people', and in the course of his marches into India during a period of thirty years and more, utterly ruined the prosperity of the country' The plundering raids into India by Mahmūd of Ghazna was the first and most serious calamity that befell the Hindu people ever since their formation, and for the terrible *but-shikan* or 'image breaker Mahmūd, as for one who did the greatest amount of harm to them, the Hindus could not have any affection A dispassionate Muslim scholar of India like Professor Habib of Aligarh has shown how Mahmūd's 'Turkī method' of trying to spread Islam by force utterly defeated its purpose This method of 'blitz' attack and destruction inaugurated by the Turks in the tenth century against the Hindus and continued by them with vigour in the eleventh and twelfth evoked the following observation from the great Sūfī mystic poet of Iran, Jalāluddīn Rūmī (died 1274)

Hindūyak-i-hastī-rā tu Turkānā naghma kun.

'In the manner of the Turk, do thou plunder life like the wretched Hindu'

It was gradually realized that this 'Turki way' of Mahmūd, this *Turkānā tarīqā*, was not of any use in winning the people of India, both the upper classes and the masses, to Islam The other method, that of peaceful persuasion, on the other hand met with phenomenal success in India—the method or way of the Sūfī saint or preacher, *Sūfiyānā tarīqa* of the Sūfī miracle-working saint who lived among the Hindu masses and by gentleness and the example of his life of prayer and contemplation and indirect persuasion managed to effect mass conversions of Hindus, in places far away from centres of Islamic political power in India So long as Mahmūd found it

to consolidate the Indian province of the Panjab which he added to his empire in 1014, he did not cease from attacking and fighting the Hindus

Some time after annexing the Panjab to his empire, this great enemy of the Hindus and of their religion and culture this Butshikan, issued a special type of coins for his Indian province and on these coins in the matter of the legend something was done which was never done before and after in the annals of Islamic numismatics. In the Muslim coins of the specific Islamic type established from the time of the Omayyads, we have these things as almost indispensable (i) the *kalima* or the Islamic creed *lā-'ilāha 'illā-llāh, Muhammad rasūlu-llāh* 'there is no god except Allāh, and Muhammad is His prophet' in Arabic, (ii) the name of the king who issues the coin, with or without his titles (iii) mention of the place (or mint) where the coin was struck also in Arabic *duriba* (or *zuriba*) *hadha al-dirham* (or *al-dīnār*) *fi* 'this *dirham* (silver coin) or *dīnār* (gold coin) has been struck in . ', (iv) mention of the date, in the *Hijra* era. The Indian coins of Mahmūd, we find to be bilingual, in the first instance. On one side we have everything in Arabic, as is usual in coins of Muslim rulers, and on the other side, we have, and this is specially to be noted, the translation of the Arabic legend in Sanskrit. For the first (and perhaps for the last) time in the history of Islam a Muslim sovereign has allowed a translation of his religious creed into a language which is the vehicle of a religion and culture which he has been taught to be antagonistic to Islam. The translation of the *kalima* runs thus *avyaktam ekam, Muhammada avatāra*. This is not, however, a literal translation of the Arabic, Muslims would at first sight object particularly to the second part, for Muhammad is not regarded as an *avatāra* or incarnation of God, he was as human as any of his followers, contemporaneous or future. But it should be borne in mind that in the tenth-eleventh centuries, Islam in Persia and Afghanistan was not the simple creed of the Qur'an—it was already suffused and coloured with the mysticism of Sufism. Muslims in India are even today taught from thousands of pulpits by Wā iz-es or preachers on the occasion of a religious ceremony like the *Mi'lād Sharīf* or *Maulud Sharīf* or the celebration of the birthday of the prophet that a special spirit of light, known as the *Nūr-i-Muhammadī* or 'the Light of Muhammad', was created by God even before the creation of the world, and it was resting in Heaven for æons, and then with the help of portions of this spirit of light the angels and other creatures were created, and it was finally this Light of Muhammad which descended upon earth and incarnated itself as the future prophet in the womb of Amina. All this miraculous legend was a part of the Muhammad story or the 'Golden Legend' of Muhammad as it came to India. So that to describe

Muhammad as an *avatāra* or incarnation of God was not wrong from this point of view, and such a description would fit in well with the legendary account which popular Sūfī and other preachers must have started giving to all and sundry and particularly to the actual and possible converts from among the Hindus in the Panjab

We shall revert to the translation of the first part of the *kalima* later

The other Arabic inscriptions giving the names of the king and of the mint and the date have been very carefully and literally translated *ayam tankah Muhamadapure ghatte ihatah* 'this silver coin has been struck in the *ghatta* or mint at Muhammadapur, i e Lahore', *Nrpati Mahamūda* 'King Mahmūd', *Jināyana-samvati* 'in the year of the passing (*ayana*) of the *Jina* (= Prophet)' The translation of the name *Hijrah*, or 'Flight or Passage', properly *Hijratu-n-Nabi* 'the flight of the Prophet' shows a remarkable care or anxiety to bring the meaning of even the era of Islam which was new to the Hindus and so to make them curious about it A number of examples of this bilingual coin have been found, and they show different dates (e g 412 A H, 419 A H = 1021 A D, 1028 A D) and slightly different readings, in one of them the expression *bi-smi-llāh durība* occurs, and *bi-smi llāh* here has been correctly rendered by *avyaktīya-nāme* (References Edward Thomas, 'On the Coins of the Kings of Ghazni (961–1171 A D)', London, 1848, p 57, Chas J Rodgers, 'Catalogue of Coins collected by Chas J Rodgers and purchased by the Government of the Panjab', Part II, Miscellaneous Muhammadan Coins, Panjab Government Publication, Calcutta, 1894, p 28, Coins No 38ff, Stanley Lane Poole, 'Catalogue of Coins in the British Museum', referred to by K N Dikshit, K N Dikshit, 'A Note on the Bilingual Coins of Sultan Mahmud of Ghazni', JRASB, Letters, Vol II, 1936, No 3, issued 1938, Numismatic Supplement p 29, Stanley Lane Poole, 'Mediæval India' ('Story of the Nations' series), London, 1900, p 27 for picture of an example of this coin struck in 418 A H = 1027 A D, Jayachandra Vidyālankār, *Itihās-Praveś* (in Hindi), Vol I, Allahabad, 1930, pp 213, 216)

The promulgation of coins with legends in Sanskrit, with even a Sanskrit translation of the holy creed of Islam, was certainly, from orthodox Muslim point of view coloured as it used to be (and still largely is) by anti-Shu'ubiya (i e pro-Arab) tendencies even among non-Arabs a very great concession to the tax-paying infidel subjects conquered by the arms of Islam One wonders how Mahmūd of Ghazna, who spent thirty years of his life in fighting the Hindus, made this great allowance for his newly conquered Hindu subjects by bringing to them the message of Islam through their own language, and, in giving their language a place on the coins of the realm, further he seemed to stabilize them in their nationalism Probably it

was the expression of an astute political sagacity—he did not want to antagonize the large Hindu population who after the annexation of the Panjab formed such a large percentage of his subjects It might have been a spontaneous gesture of magnanimity or liberality in ideas

But with the background of Al-Bīrūnī's *Indica*, and the presence of his cultured and sympathetic personality in the entourage of Mahmūd at Ghazna, one would like to think that Al-Bīrūnī deserves the credit for this friendly and cosmopolitan spirit towards the Hindus, this expression of respect for the learning and culture of Hindu India by recognizing their language No Brahman or Sanskrit scholar from India could be expected to be in any way connected with it Mahmūd of Ghazna, it is said, was on one occasion presented with some Hindi, i e Apabhramśa verses from a Rajput prince in which the bravery of a number of Turki soldiers in tackling some elephants which were let loose was celebrated, and it is further narrated that having got these verses translated by learned men (i e Hindi or Apabhramśa-knowing scholars) who were about him, he was delighted with them But it would be too much to expect that a Brahman from India, or some other Hindu, would be responsible ultimately for the Sanskrit legends on Mahmūd's Indian coins

If Sultān Mahmūd could be persuaded by anybody in this matter, it could be only by Al-Bīrūnī And the way in which th translations of the Arabic legends were made into Sanskrit certainl indicates the hand of Al-Bīrūnī *Jina* has been employed as th equivalent of the Arabic *Nabī* or *Rasūl* = 'Prophet' Al-Bīrūnī i his work (MS p 57, l 14, and p 121, l 17) uses the word *jina* twice and this he uses as an equivalent of Buddha (*Jinu, wahuwa al Buddu*) He knew that Buddha was just the founder of the sec of red-robed Shamanians or *Sramanas*, and possibly he thought th less common word *Jina* might be a suitable word (in the absenc of any current one) for 'Prophet' Then, from the translation of th first part of the *kalima* we can see Al-Bīrūnī's hand 'There is no go but Allāh' has been rendered as *avyaktam ekam* 'the Unmanifest i One' This is not at all a literal translation it is at best a roundabou and explanatory one But it has its justification from Al-Bīrūnī' point of view An *ilāh* in Arabic was more often a tangible, visibl object of veneration, a god represented by an idol, rather than th abstract idea of divinity, and *Allāh* was the reverse of this kind o *ilāh* or visible god—the Divinity without any corporeal form Sucl a Divinity, without form, alone existed there was no *ilāh* or go to be considered So 'the Formless (Divinity) is One' was a trans lation of the spirit of the first part of the *kalima*, with Islam' uncompromising aniconism, and such a translation was very nea to the language of Hindu spiritualism or philosophy, which revelle

in passages like *ekam sat* ('that which is, is One'), and *ekam evâdvitīyam* ('the One without a second')

Moreover, the word *Avyakta* was understood by Al-Bīrūnī to mean specially 'the one without form or shape' (*'bykt 'y šy' bl' swrth = avyakta, ayyu šayyun bilā sūrat^h a*) This of course is only one of the senses of the word, and not the most prominent The proper meaning is 'unmanifested': and this manifestation is not merely through form, but it embraces all other kinds of manifestation or expression tangible by one or more senses *Avyakta* as a translation of *Allāh* is not very happy, but if we think that formlessness or absence of shape (*sūrat*) is the fundamental characteristic of Allāh, and if we select among the very wide range of meanings of the Sanskrit word *avyakta* only this one, namely, 'without form', then this rendering is allowable

One is reminded of the controversy which took place among scholars in China, Buddhists headed by Hiuen Ts'ang and Taoists, over the proper Sanskrit translation of one of the fundamental terms in Chinese philosophy, namely, the word *Tao*, which is usually translated into English (taking the fundamental pictographic and ideographic sense of the character in the Chinese script representing it) as 'Way' The Taoists wanted to render it by Sanskrit *Bodhi* = Superior Wisdom, Perception', while Hiuen Ts'ang, who did not have much sympathy for the Taoist doctrine, insisted that the Sanskrit *Mārga* = 'Path (leading to what one seeks as destination)' was the only proper equivalent They did not come to any decision although it would appear the Vedic word *Rta* meaning 'Cosmic Order, Cosmic Law, Cosmic Path' from an original sense of 'Way', from root *r* 'to go' would be the best Sanskrit equivalent

The translation of *Allāh* by *Avyakta* on the coin of Mahmūd in this sense, which we find registered in his *India*, would suggest that Al-Bīrūnī was responsible, at least for the Sanskrit legend And it is not even unlikely that Al-Bīrūnī was personally responsible for the suggestion It will be conceded from what has been said above that this is not too much to assume And this would place Al-Bīrūnī in a new light as a lover of Sanskrit, and as a practical applier of the principle of self-determination in matters of language and culture for peoples, particularly those with a high civilization of their own Buddha, when he declared that people everywhere were to benefit by his teachings through their own languages, gave a great charter of freedom to all and sundry even when becoming his votaries The insistence on a particular sacred language for prayer and preaching denied this great freedom to many peoples It was remarkable that this great freedom should be made accessible to the Hindus of the Panjab under foreign rule in the eleventh century A D, and it is very likely that a cosmopolitan scholar and liberal spirit like Al-Bīrūnī, as we have tried to show above, should at least

be partly responsible for it. And after the expiry of nearly ten centuries, we can only offer our tribute of respect to the memory of a great man, who was not only a great scholar but also a most liberal internationalist for his age, one of the beacon-lights in the path of man's intellectual progress.

NOTE.—After the above article was in print, my esteemed friend Dr Vāsudeva Śarana *Agravāla* of the Archaeological Survey of India drew my attention to his reading of the Sanskrit legend in the coins of Mahmūd of Ghazna, which was first published in the 'Journal of the Numismatic Society of India', Vol V, Part II and then in 'Journal of the United Provinces Historical Society,' Vol XVII, Part II, December 1944, Lucknow, pp 45–54. Dr Agravāla has reviewed previous readings, which he generally accepts, only for *Jināyana-samvati* as a translation of *Hijra* year, Dr Agravāla reads *Tājikīyera-samvatī* = 'the Tājika, i e Arab year', *Tājika* for 'Arab' being from the Persian *Tāzī*, *Tāzīk*. This reading appears to be correct, only the affix *-yera*, in spite of Dr Agravāla's explanation, still presents some difficulties. About the Sanskrit rendering, he also thinks it possible that it was done by the great Al-Bīrūnī himself.

AL-BĪRŪNĪ ET L'ALCHIMIE INDIENNE

Par

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L'oeuvre du grand Al-Bīrūnī est une des sources essentielles de notre connaissance de l'Inde du haut Moyen-Âge L'analyse approfondie qu'en a donnée, le premier, Reinaud, dans son *Mémoire géographique, historique et scientifique sur l'Inde antérieurement au milieu du XI^e siècle de l'ère chrètienne, d'après les écrivains arabes, persans et chinois* (*Mémoires de l'Institut National de France, Académie des Inscriptions et Belles-Lettres*, t XVIII, 2^e partie, p 1–399 et p 565-566) a marqué une date dans l'histoire de l'indologie et, à quelques mois près, le centenaire de cette oeuvre, publiée à Paris en 1849, se trouve coincider avec le millénaire du grand indianiste arabe dont elle a fait connaître toute la valeur

Les précieuses édition et traduction de *l'Inde* d'Al-Bīrūnī par Edward C Sachau (1886 et 1888) ont livré tout le détail de ses informations et sont depuis soixante ans des instruments de travail fondamentaux Mais elles n'ont pas rendu inutile le *Mémoire* de Reinaud, parce que celui-ci confrontait les données d'Al-Bīrūnī avec les témoignages arabes persans et chinois et avec les données indiennes elles-mêmes, et sa méthode demeurera toujours indispensable pour bien interpréter le texte d'Al-Bīrūnī

Pour l'avoir méconnue on a tiré de ce texte une notion gravement erronée sur l'histoire de l'alchimie indienne

Plusieurs des textes les plus célèbres de cette alchimie sont attribués par la tradition à Nāgārjuna, qualifié à cette occasion de *siddha*, 'Parfait', et placé ainsi dans la catégorie des savants surhumains dont des listes variées sont données et qui comprennent des personnages qu'il est impossible de considérer comme très anciens Par ailleurs, divers textes tendent à identifier l'alchimiste Nāgārjuna avec le patriarche bouddhiste du même nom, contemporain de Kanishka ou en tout cas, appartenant à un des premiers siècles de l'ère chrétienne Or, une indication d'Al-Bīrūnī a paru infirmer cette identification et ramener l'alchimiste Nāgārjuna au X^e siècle Al-Bīrūnī donne, en effet, comme un fameux alchimiste indien, auteur d'un traité important un Nāgārjuna natif du fort de Daihak près de Somnāth, et ayant vécu environ une centaine d'années avant son temps, donc au X^e siècle

Cette indication a été acceptée telle quelle, notamment par Winternitz (*Geschichte der indischen Litteratur*, t III, Leipzig, 1920,

p 552) Il en résulterait que le Nāgārjuna considéré par la tradition indienne comme un des fondateurs de l'alchimie dans l'Inde, serait non pas le personnage bouddhiste célèbre, mais un homonyme tardif, que la tradition le confondant avec ce personnage bouddhiste serait postérieure au X^e siècle et que l'alchimie indienne ne se serait formée qu'à cette époque, en dépit de ses prétentions à l'antiquité Cette alchimie serait donc plus récente que les débuts de l'alchimie arabe et pourrait avoir été constituée à l'imitation de celle-ci

La comparaison d'un témoignage chinois avec celui d'Al-Bīrūnī ruine toute cette théorie Trois siècles avant l'époque assignée par Al-Bīrūnī au Nāgārjuna de Daihak, vers 630, le pèlerin chinois Hiuan-tsang atteste, en effet, dans son *Si-yu-ki*, "*Mémoire sur les contrées occidentales*", que, dès lors, le patriarche bouddhiste Nāgārjuna était réputé dans l'Inde comme alchimiste Il prenait, dit Hiuan-tsang, des drogues pour augmenter sa longévité et il aurait une fois changé des pierres en or (trad Stanislas Julien, Paris, 1859, t II p 98 et 103)

Il ne s'ensuit pas qu'Al-Bīrūnī se soit trompé en donnant un Nāgārjuna relativement récent comme un auteur important d'alchimie indienne, ni que le patriarche bouddhiste Nāgārjuna ait réellement été un grand alchimiste Mais il en résulte qu'on ne peut tirer argument de l'époque où vivait le Nāgārjuna d'Al-Bīrūnī pour révoquer en doute la tradition indienne d'après laquelle le patriarche Nāgārjuna aurait déjà pratiqué l'alchimie, et pour faire descendre jusqu'à une époque tardive les débuts de l'alchimie indienne Le Nāgārjuna d'Al-Bīrūnī ne peut être qu'un homonyme du personnage illustre dont la réputation d'alchimiste était faite depuis des siècles

Al-Bīrūnī, d'ailleurs ne doutait pas que l'origine de l alchimie indienne ne remontât beaucoup plus haut que l'époque du Nāgārjuna qu'il mentionnait Il a parlé, en effet, d'un autre alchimiste, Vyādi, en le faisant vivre à Ujain au temps du roi Vikramāditya (trad Sachau, I, 189) Il distinguait deux rois de ce nom, le fondateur de l ère "vikrama" et le vainqueur du Saka fondateur lui-même de l'ère de 137 ans plus récente (II, 6), mais il a précisé, à propos de Vyādi, que le Vikramāditya dont il était contemporain était le fondateur de l'ère portant son nom Comme il connaissait l'antiquité de cette ère (57 avant J C), il admettait donc l'ancienneté de Vyādi De plus, il ne faisait pas de Vyādi un fondateur de la science qu'il avait cultivée Il racontait, en effet, une légende d'après laquelle Vyādi s'était d'abord ruiné en vaines tentatives pour réaliser les prescriptions d'un livre déjà existant d'alchimie qu'il avait mal compris Vyādi aurait interprété le composé *raktāmala* comme signifiant "myrobolan (*amala*) rouge (*rakta*)", alors qu'il aurait fallu comprendre "sang humain et huile", ce qu'il aurait par la suite reconnu fortuitement, des gouttes de son sang étant tombées de sa

tête dans son creuset alors qu'il s'était blessé à la tête après s'y être brûlé et avoir huilé la brûlure (Sachau, I, 190).[1]

Bien entendu, Al-Bīrūnī n'a pas garanti l'authenticité de la légende, mais il nous suffit ici de constater qu'il n'y a dénoncé aucun anachronisme.

En ce qui concerne l'existence d'un auteur alchimique du nom de Vyāḍi, nous pouvons confirmer l'information d'Al-Bīrūnī. Sachau ne connaissait sous ce nom qu'un lexicographe (II, 315), mais le *Tanjur* tibétain contient la traduction d'un *Rasasiddhiśāstra*, qui ne semble pas nous être conservé en sanskrit, qui est attribué à Vyāḍi et dont un extrait a fait, lui aussi, l'objet d'une traduction tibétaine (*Mdo 'grel*, CXXIII, 1 et 3, cf. P. Cordier, *Catalogue du fonds tibétain de la Bibliothèque Nationale*, t. III, Paris, 1915, p. 473). On a signalé de plus que Vyāḍi est cité comme autorité dans le *Rasaratnasamuccaya* et le *Rasaratnapradīpa* (cf. G. N. Mukhopadhyaya, *History of Indian Medicine*, t. III, Calcutta, 1929, p. 758). M. G. N. Mukhopadhyaya le suppose postérieur à Pāṇini (en l'identifiant au grammairien du même nom) et antérieur à Nāgārjuna, et il le place au V^e^ siècle avant J. C. Nous n'avons pas, toutefois, de preuve qu'il faille identifier l'alchimiste au grammairien. Une indication d'après laquelle celui-ci habitait les Vindhya, semble même le distinguer de l'alchimiste d'Ujain, quoiqu'un même personnage ait pu vivre successivement en des lieux différents. On pourrait plutôt, mais encore sans preuve décisive, chercher à identifier l'alchimiste Vyāḍi avec l'auteur de même nom d'ouvrages tantriques traduits dans le Tanjur (*Rgyud grel*, LXXIV 34, 37 et LXXVI 29 et 30). Nous ne pouvons pas non plus le faire remonter au V^e^ siècle avant notre ère sans nous heurter au témoignage de la tradition notée par Al-Bīrūnī qui le place au I^er^. Il se pourrait seulement qu'il eût été antérieur à Nāgārjuna si cette tradition était certaine, mais l'attribution d'un auteur à l'époque de Vikramāditya est un usage fréquent et arbitraire (plusieurs auteurs réputés de ce temps, sont en réalité des premiers siècles de l'ère chrétienne et non contemporains les uns des autres). Vyāḍi se trouve nommé juste avant Nāgārjuna dans la liste d'alchimistes qui est donnée au début du *Rasaratnasamuccaya* de Vāgbhaṭa (I, 3) et c'est encore lui qui apparaît sans doute sous le nom de Vyāḷācārya en tête d'une autre liste similaire du même ouvrage (VI, 57), où Nāgārjuna occupe le cinquième rang. Mais on ne peut considérer l'ordre adopté dans ces listes comme chronologique car, pour un bon nombre de noms,

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[1] Sachau (II, 315) n'a pas vu comment ***raktāmala*** pouvait signifier 'sang et huile' mais ***rakta*** signifie normalement en sanskrit 'sang' en même temps que 'rouge'. Seul ***amala*** fait difficulté ne signifiant pas 'huile' mais 'pur'. Il faut admettre que le texte faisait l'ellipse du mot *taila*, 'de la pure' étant mis pour 'de l'huile pure'. Ce style équivoque est bien dans la manière des traités indiens d'alchimie.

il diffère complètement d'une liste à l'autre (les noms mêmes ne concordent pas tous)

L'étude approfondie de la littérature alchimique indienne, telle que l'a inaugurée Praphulla Chandra Ray, pourra seule élucider des questions de ce genre En attendant, les données d'Al-Bīrūnī nous sont précieuses, à condition de les confronter avec celles d'autres sources Cependant le caractère ésotérique de la tradition alchimique indienne les a rendues plus difficiles à acquérir pour Al-Bīrūnī et moins sûres que dans d'autres domaines C'est ainsi qu'Al-Bīrūnī a conçu pour les enseignements de cette tradition un mépris qui s'explique parce qu'il n'y voyait que vaine recherche de richesses et de pouvoir magique et parce qu'il n a pas pu s'informer avec précision des méthodes employées La partie chimique de cette tradition, qui n est nullement sans valeur, ne lui a pas été présentée et il n'en a pu connaître que la partie alchimique

Ceci résulte du fait qu'il dit lui-même n'avoir pu déterminer avec certitude si les Indiens opéraient surtout sur une matière minérale, animale ou végétale quoiqu'il lui ait paru que c était plutôt sur une matiere minérale Ceci résulte aussi de fausses indications qui lui ont été données C'est ainsi qu'il traduit *rasa* par "or" (Sachau I, 188), tandis qu'il s'agit soit du "mercure", soit du cinabre, soit de toute une série de 'corps essentiels ', c'est à dire trouvés à l'état natif tels que le cinabre (*rasa*, *daraka*, *hingula*), le mica (*abhra*), les pyrites (*mākṣhika*) etc Il donne aussi *tālaka* (I, 188) comme le nom indien du talc (arabe *tālq*) alors que *tālaka* désigne en sanskrit l'orpiment qui se présente, il est vrai, en lamelles comme le talc, mais qui est jaune (cf *Rasaratnasamuccaya* III, 66 et suivants)

De ce fait, ce sont surtout ses témoignages sur les légendes indiennes relatives aux alchimistes qui nous sont utiles Outre celles que nous avons rappelées sur un Nāgārjuna et sur Vyādi, il nous en a preservé une autre dont un pendant exact est connu au Cambodge dans l'histoire du Roi Lépreux d'Angkor Thom

La tradition populaire cambodgienne raconte en effet que ce roi, invité par un brahmane alchimiste à se plonger pour se guérir dans un bain médicinal bouillant, aurait voulu que le brahmane s'y plongeât le premier Celui-ci aurait accepté à la condition que le roi jetât sur lui, à un moment voulu, une certaine poudre Le roi, après avoir promis, s'abstint de jeter la poudre et le brahmane mourut (Cf G Porée et E Maspero, *Moeurs et coutumes des Khmèrs*, Paris, 1938, p 73)

Al-Bīrūnī raconte de son côté (I, 191) le même évènement mais à la différence que le roi n'est pas lépreux Il est invité par un alchimiste à plonger dans une huile bouillante préparée pour le rendre immortel, victorieux et invincible Il n'ose pas et accepte que l'alchimiste s'y plonge lui-même tandis qu'il jetterait divers paquets

de drogues successivement dans le bain Mais, craignant que l'homme ne ressorte immortel, victorieux et invincible, il s'abstient de jeter le dernier paquet L'homme meurt et se trouve changé en un bloc d'argent La scène est localisée à Dhāra, capitale du Mālava

L'histoire indienne d'Al-Bīrūnī est plus claire que son pendant cambodgien où le mobile qui empêche le roi de tenir sa promesse reste obscur, mais il s'agit manifestement d'une même légende, apparemment transportée de l'Inde au Cambodge Ainsi, une fois de plus, le précieux texte d'Al-Bīrūnī reçoit de la comparaison avec des données qui lui sont étrangères un surcroît d'intérêt et de portée

LE CITAZIONI DELLE *LEGGI* PLATONICHE IN AL-BĪRŪNĪ

Per

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È noto che l'*India* di al-Bīrūnī racchiude numerose citazioni di opere classiche greche,[1] le più antiche delle quali sono il *Fedone*, il *Timeo* e le *Leggi* di Platone. Ignaro a quanto pare del greco, e con solo qualche superficiale conoscenza di siriaco, al-Bīrūnī dovè attingere queste citazioni a traduzioni arabe di quei classici condotte direttamente o per trafila siriaca, la cui familiarità attesta nel grande scienziato musulmano la sua sete di sapere anche in quei campi a cui per ragioni linguistiche gli era precluso un diretto accesso. Queste versioni arabe di scritti greci, più che il puro testo degli originali, ne riproducono di solito delle parafrasi o commenti, o redazioni in cui testo e commento sono mescolati insieme, talora con più o meno profondi svisamenti del testo primitivo. Ciò, per limitarci qui alle citazioni platoniche, è stato dimostrato dal Sachau per il *Fedone* e il *Timeo*, di cui al-Bīrūnī sembra aver avuto dinanzi tali edizioni parafrastiche.[2] Questa nostra nota si propone di esaminare le citazioni in *India* delle *Leggi*, per chiarire se anche per esse sia da presupporre in al-Bīrūnī l'uso di una parafrasi del genere, o d'una vera e propria versione relativamente fedele.

Osserviamo anzitutto che a differenza degli altri due scritti platonici, per tutte e tre le citazioni delle Leggi in al-Bīrūnī (sette, se si consideri la prima più lunga e multipla scomposta nei suoi singoli elementi), è stato possibile indicare con esattezza il corrispondente luogo dell'originale. V'è anche una quarta citazione, (190, 9-12), sulla genealogia di Ippocrate, che manca nel testo greco, ma al-Bīrūnī stesso ci avverte che era inclusa fuor del libro (*khāriğa l-kitābi*) a mo' d'appendice, e ignoriamo con qual nesso nell'esemplare di cui disponeva. Questo si iniziava con l'esatta divisione in libri, conservando non solo la forma dialogica ma la cara terizzazione degli interlocutori (*India* 51, 9-12 = *Leges* 624):

(1*a*) Dice lo straniero Ateniese —Chi ritieni sia stato causa per voi della istituzione delle Leggi, un essere superno

[1] Vedine l'elenco nella versione del Sachau, *Alberuni's India*, I, XLI.

[2] *Alberuni's India* II, 271-72, 277-78. Cfr Rosenthal, *On the Knowledge of Plato's Philosophy in the Islamic World*, in *Islamic Culture*, XIV (1940), 395: 'he (Biruni) too had not a pure, untampered text of Plato's works before him, but, may be a commented paraphrase.'

> (*ba'd al-malā'ikah*) o un uomo? Risponde lo Cnosio — Un essere superno, e in verità per noi Zeus, mentre i Lacedemonî sostengono sia stato per loro Apollo.

Segue il passo, alquanto fraintesto, sulla totalità della virtù (πρὸς πᾶσαν ἀρετήν), che il legislatore deve aver di mira (51, 12-13 = *Leges* 630 *e*)

> (1*b*) 'Il divino legislatore deve porre a suo scopo, nell'istituire le leggi, l'acquisto delle maggiori virtù e l'estremo della giustizia'

e, assai aderente al testo greco, la lode della legislazione cretese, con la distinzione in beni umani e divini (51, 13-15 = *Leges* 631*b*)

> (1*c*) 'tali appunto (per giustizia e virtù) l'autore descrive le leggi dei Cretesi, che rendon perfetta la felicità di chi rettamente le usa, poichè egli con esse viene a possedere tutti i beni umani connessi con quelli divini'

Molto interessanti i due passi del secondo libro, che completano questo primo gruppo di citazioni e investono nel complesso felicemente, salvo l'ultimo punto, materia prettamente greca (51, 15-20 = *Leges* 653 *cd*+653*e*—654*a*)

> (1*d*) 'Dice l'Ateniese nel secondo libro —Gli Dei, avendo avuto pietà del genere umano nato ai travagli della vita stabilirono per gli uomini delle festività in onor degli Dei, delle Muse (*Sakīnāt*),[1] di Apollo loro duce, e di Dioniso che donò agli uomini il vino come rimedio all' amarezza della vecchiaia, perchè tornassero giovani dimenticando la tristezza, e si mutasse l'animo loro da angustia in salute'
>
> (1*e*) 'E dice anche che essi ispiraron loro le norme della danza e del ritmo, per compensarli dei travagli, e perchè si abituassero con loro nelle festività e nelle gioie, e perciò un genere di musica, in allusione alle preghiere agli Dei, fu chiamato "inni di lode"'[2]

Dal terzo libro è la citazione, o meglio riassunto della pagina platonica, sugli antichi cataclismi e spopolamenti della terra, e sullo

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[1] La stessa parola apparirà più oltre usata dal traduttore arabo per rendere δαίμονες e ἥρωες esseri cioè superiori agli uomini, ma inferiori agli Dei La esegesi coranica a sūra II, 249 (p es Ṭabarī, *Tafsīr*, II, 364-66) aveva dato alla misteriosa *sakīnah* presente nell'Arca sembianze antropomorfiche e teriomorfiche di netta derivazione dalla demonologia pagana Cfr Goldziher *Abhandlungen zur arabischen Philologie* I, 176-204

[2] Qui è del tutto irriconoscibile l'etimologia platonica in 654*a* χορούς τε ὠνομακέναι τὸ παρὰ τῆς χαρᾶς ἔμφυτον ὄνομα Ci si potrebbe poi domandare se quel *fi r-ramz* del testo Sachau non sarebbe forse da leggere *fī-z-zamr* 'musica auletica' per la preghiere agli Dei

stato innocente e felice dell'umanità all'alba della sua storia (193, 11–15 = *Leges* 677*a-b*, 678*e*–679*b*). Della forma dialogica si serba ancora traccia, benchè inesattamente, chè nell'originale tutte le affermazioni sotto riportate sono in bocca all'Ateniese.

(2) 'Dice l'Ateniese nel terzo libro che ci furono nella terra diluvi e morbi e cataclismi, in cui non si salvarono del genere umano se non pastori e montanari, furono, questi superstiti della specie, inesperti di frode e desiderio di sopraffare. E dice lo Cnosio che essi da principio si amavano schiettamente fra loro, per la solitudine del mondo deserto e perchè non era loro angusto lo spazio,[1] nè li obbligava a darsi da fare (per sostentarsi), non esisteva presso di loro indigenza, ed essi non avevano possedimenti nè beni,[2] nè avarizia nè argento nè oro. Non v'eran tra loro nè ricchi nè poveri. E se trovassimo loro scritti, ne abbonderebbero le testimonianze.'

Assai meno felice di questo passo, ove l'originale è inteso e riassunto ottimamente, è l'ultima citazione dal libro quarto, sulla gerarchia degli onori dovuti agli Dei patrii, ai demoni, eroi e genitori (59, 17–19 = *Leges* 717 *b-c*).

(3) 'È doveroso per chi rende i pieni onori (alla divinità) di prendersi a cuore il culto degli Dei e degli eroi (o dèmoni, *Sakīnāt*), e di non porre idoli particolari a capo degli Dei patrii, quindi gli onori dovuti ai genitori da vivi sono tra i massimi doveri, nella misura del possibile.'

Per giudicare della relativa aderenza all'originale di queste citazioni in al-Bīrūnī, può essere interessante confrontarle con i relativi passi del *Sommario* delle Leggi di al-Fārābī (ms 1429 della Biblioteca di Leida), di cui è in preparazione l'edizione nel *Plato Arabus* di Oxford. Diamo qui tradotti di seguito i vari luoghi.

(1*a*) Fārābī fol. 2. 'Interroga uno sulla causa della istituzione delle leggi, cioè sul loro istitutore e fondatore. E risponde un altro che istitutore fu Zeus, che presso i Greci è il padre del genere umano, e cui si riferisce ogni cosa come causa suprema. E ricorda anche un'altra istituzione delle Leggi.'

(1*b*) fol. 3. 'Spiega come il proposito del legislatore in ciò che escogita e tocca sia il desiderio del favore divino e il

[1] Il τροφή e νομή del greco farebbe inclinare a leggere *ġidhā'uhum* in luogo di *'arā'uhum*, se non vi fosse l'immagine del *dāqa bihim*, che esige appunto un nome di luogo.

[2] Da leggere certo *'aqār* (οἰκήσεις καὶ σκευή) anziché *'iqād* (Sachau traduce 'contract', ma il plurale di *'aqd* è *'uqūd* e non è certo da pensare a un infinito).

conseguimento del premio celeste e dell'altra vita, e il procacciamento della somma virtù. '

(1*c*) fol 3 (manca la menzione delle leggi di Creta) 'Divide poi le virtù, e spiega che ve ne sono di umane e divine'

(1*d-e*) fol 6 'Il legislatore stabilì giorni e tempi festivi con cui gli uomini si dilettassero, e che fossero loro divini piaceri, e così i generi musicali cui dettero corso per la naturale inclinazione in ciò nota, e per un divino piacere E adduce esempi noti presso di loro, come la danza e il suono dei flauti. '

(2) fol 9 '(la legge si oblitera) per accidenti sulla terra, come diluvi e malattie mortali, che estinguono gli uomini Cita poi in esempio il diluvio, con cui furono sommerse le altre città, e cominciò poi a raccogliersi e crescere una nuova. E in principio quegli uomini ebbero costumi lodevoli, che poi, col crescere della moltitudine, mutarono, in quel tempo, cioè dopo il diluvio, si guardavano tra loro con volto lieto e benigno ed animo amico, ma poi, crescendo di numero, cominciò a poco a poco a crescer fra loro l'invidia '

(3) fol 13 'Si volge poi a parlare dei figli e dei padri, dei loro doveri ed uffici, e come li adempiano ecc '

Un confronto fra questi estratti di al-Fārābī e le relative citazioni di al-Bīrūnī è tutto a vantaggio di queste ultime Ciò è certo in parte dovuto al carattere compendiario dell'operetta farabiana, ma anche a un assai maggior contatto con l'originale che la fonte di al-Bīrūnī rivela si vedano in particolare 1*a*, 1*c*, 2 Gli interlocutori sono meglio specificati, la forma dialogica, subito perduta in al-Fārābī, lascia ancor qualche traccia in Bīrūnī Se possedessimo intera la fonte di questo, come intero abbiamo il compendio di al-Fārābī (che conosce però solo i primi nove libri delle Leggi), tale divario qualitativo apparirebbe probabilmente ancor maggiore

Concludendo, la redazione araba delle *Leggi* di cui si servì al-Bīrūnī (e che potrebbe esser quella di Hunain ibn Ishāq o di Yahyà ibn 'Adī, ricordate dal *Fihrist*)[1] ci sembra da questi saggi una vera e propria versione (s'intende, come al solito, piuttosto libera e qua e là parafrastica), anzichè una sistematica parafrasi o un commento, quale fan presumere alcune delle citazioni del *Fedone* e soprattutto quelle del *Timeo*, nell'opera biruniana Almeno per quanto riguarda le *Leggi*, l'autore dell'*India* ebbe forse dinanzi un Platone più genuino che non il 'Maestro secondo' al-Fārābī, il caposcuola del (neo) platonismo nel mondo musulmano

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[1] *Fihrist* 246 Per quella di Hunain, vedi anche Bergstraesser, in *Abhandlungen für die Kunde des Morgenlandes*, XVII (1925) 50 (*fi s-sunan*).

REMARKS ON AL-BIRUNI'S QUOTATIONS FROM SANSKRIT TEXTS

By

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As is well known,[1] Al-Biruni gives a list of names of the eighteen Purânas, which is of interest to students of Sanskrit literature, because it shows that these texts existed in the first half of the eleventh century Of this huge mass of literature the Arabic author has only consulted parts of the Matsya, Āditya, Vâyu and Visnu Purânas, and, also, the Visnudharmottara Now his quotations from these works do not always tally with the Sanskrit texts which we possess in our editions

This fact has, of course, been stated by Sachau in the copious annotations added to his translation of Al-Biruni's admirable 'History of India' It would, however, appear to me that the learned translator has put too many question-marks in his commentary Now that we have more texts at our disposal and have gained a deeper insight into the Puranic traditions and the history of this kind of literature, it is possible to give some additions and to propose some corrections on his notes In most cases these corrections remove any doubt as to Al-Biruni's accuracy and familiarity with the texts which he consulted

Whereas for instance, Sachau[2] must confess that he did not know the Sanskrit original of the Visnu-Dharma quoted by the Iranian scholar, and stated that it is totally different from the Visnu-Smrti or Vaisnava-Dharmaśâstra, translated by Jolly, other scholars have seen that this work is in fact identical with the Visnu-dharmottara-Purâna,[3] as has been surmised by Sachau himself at the end of his note

'When, at the end of the yuga the evil will have reached its highest pitch', Al-Biruni says[4] in accordance with this Purâna, 'there will come forward Garga the son of J-S-V, the Brahman, i e Kali after whom this yuga is called . ' And further on[5] he

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1 Al-Biruni, Tarikh al-Hind, XII, p 63, E C Sachau, Alberuni's India, an English edition (London, 1910), I, p 130

2 Sachau, o c, II, pp 275f

3 I refer to M Winternitz, Geschichte der indischen Litteratur, p 446

4 Tarikh'al Hind, XLIII, p 192, Sachau, I, p 382

5 XLVI, p. 199, I, p 397.

quotes from the Visnu-Purâna ' in the Kaliyuga, (Visnu) in the shape of Kali, the son of J-Š-V, the Brahman (will appear) to kill all, and to make the cycle of the yugas begin anew '

Now, this name of J-Š-V, which puzzled Sachau, is, in fact, not in the passage of the Visnu-Purâna quoted by the German translator, viz 3, 2, 57f, which runs as follows *kaler ante punar harih| kalkisvarûpî durvrttân mârge sthâpayati prabhuh* It cannot represent Yaśodâ,[1] and is, in my opinion, identical with Visnuyaśas, who, according to the same Purâna and other texts, was the father of Kalkin—for Visnu's tenth avatâra, which is yet to come, is, of course, meant by Kali in Al-Biruni's text— Vi Pur 4, 24, 26 'when the close of the Kali age shall be near, a part (*amśa*) of bhagavat Vâsudeva will be born in the house of the eminent brahman Visnuyaśas appearing as Kalkin '[2]

That the author or his source mistook Kali, the personified spirit of the evil age and the king of the godless, for his antagonist[3] can easily be explained The name Garga is unknown to me in this connection That it should be identical with Gârgya, the name of one of Kalkin's faithful relatives according to the Kalkin-Purâna,[4] seems less probable than the supposition that it is the name of the famous rsi and astronomer Garga, whose 'so-called Samhitâ' is quoted by the Iranian scholar

Among the longer quotations from the Visnu-Purâna, found in the Tarikh'al-Hind, some are of special interest After having said[5] that, according to this Purâna (where?), the number of hells is 88,000,[6] Al-Biruni translates a part of this work, which in the main corresponds with 2, 6, 7ff in the printed edition (Calcutta, 1882) As Sachau remarks, the order in which the hells are enumerated and their names differ to some extent Moreover, our Vi Pur has 23 names—and in the catalogue, vs 2-5 even 28—,whereas Al-Biruni mentions only 16 hells by name Now as to the order, this tallies with that found in the Brahmânda (U Bhâ Upa Pâ 4, 2, 146ff) and Vâyu (101, 146ff or 2, 39, 146ff) Purânas[7] These texts, which agree on many essential points—according to Kirfel they originally formed one Purâna[8]—contain, however, 29 names, of

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[1] As suggested by Sachau, o c, II, p 349

[2] See also E Abegg, Der Messiasglaube in Indien und Iran (1928), p 58 In other texts (e g Mbh 3, 190, 93, Hariv 42, 2367 and Vāyu-Pur II, 36, 104) Kalkin himself is named Visnuyaśas

[3] See also Abegg, o c, pp 20ff, 76 and 115

[4] See Abegg, o c, p 84

[5] VI, p 29, I, p 60

[6] Some texts give 28, some 21, some 28 kotis etc

[7] The Viṣṇu-Purāṇa, on the other hand, agrees, in the main, with Brahma-, Garuda-, Śiva-Purāṇas See W Kirfel, Die Kosmographie der Inder nach den Quellen dargestellt (1920), pp 148f

[8] W Kirfel, Das Purāṇa Pañcalaksana (1927), pp xff

which the numbers 3, 4, 8, 9, 14, 16, 17, 23–29 are missing in Al-Biruni's text, which has, on the other hand, a hell Rudhira after no 15 Rudhirândha Curiously enough, the name Rudhira is found in the Gar Pur, where Brahma and Vi Pur have Rudhirândha As to the names of the other hells, Kṛmîśa is the form given by Vi Pur c s, whereas Brnd and Vâ have Kṛmibhaksa (no 10) and Kṛmî (no 9)

Similarly, Viśasana exactly tallies with Vi Pur Viśasana, against Viśamsana in Brnd -Vâ, and Vahnijvâla (Al-Biruni, Vi c s) against Agnijvâla (Brnd -Vâ) Al-Biruni's last name, Sandamśaka, corresponds to Sandamśa in all other texts The impression we have from these facts, viz that Al-Biruni's source was either an intermediate between our Vi and Brnd -Vâ texts or an amalgam—if he did not amalgamate it himself in some way or other—is corroborated by a close inspection of the detailed description of punishments added to the names of the hells Some categories of sinners, mentioned by the Arabic author, are neither in the Visnu-group, nor in Brnd -Vâ, e g 'the person who helps the man who makes a false claim etc', who is condemned to the Raurava hell and 'the princes who do not look after their subjects', who go to the Taptakumbha. In other cases various categories of sinners who, according to the Sanskrit texts, go to two or three different hells, are condemned by Al-Biruni to the same place of damnation In places some particulars, whilst absent in Brnd -Vâ, tally with the Visnu text, e g in the combined description of the sinners who will come to the Vimoha(-na) and Krmibhaksa hells of the Sanskrit works the man who hates his father and the man 'who does not honour the gems which God has made glorious are mentioned by the Vi Pur ('he who hates his father and who spoils precious gems', v 14)

Other categories, mentioned by both groups of Sanskrit texts, e g in the same paragraph the maryâdadûsaka, are missing in the Arabic text The distribution of the subject-matter over the verses or paragraphs dealing with the same hell repeatedly differs in all traditions whereas, for instance, Vi Pur agrees with Brnd - Vâ in condemning the wretch who eats his meal before offering food to the gods, manes and guests to the Lâlâbhaksa, and (disagreeing with these texts which send the following categories of sinners to the same hell, viz Visamsana the maker of arrows, the potter, the robber of a golden ornament, the physician and the man who sets fire to a pleasure-garden) sentences the maker of arrows to an abode, called Vedhaka ('the piercing one'), and the maker of swords and other weapons to the Viśasana, Al-Biruni's text sends him 'who does not honour the rights of parents and grandparents, who does not do his duty towards the angels, the maker of arrows and spear-points' to Lâlâbhaksa, and, in harmony with Vi Pur the maker of swords and knives to Viśasana

Finally, the sinners in the intoxication of youth, mentioned by the Iranian author, only recur in the Śiva-Pur, which, in general, agrees with Vi Pur All things considered, it is clear that inaccuracy on the part of Al-Biruni is not the only factor to be reckoned with, when trying to explain the discrepancies displayed in his text

In commenting upon the lists of peoples who inhabit the five regions of Bhârata, given in the 29th chapter of the Tarikh'al-Hind,[1] Sachau[2] confines himself to the remark that the Arabic text mentions the directions in the following order east, south, west, north, whilst the Sanskrit Vâyu Pur has north, east, south, west As, however, with regard to Al-Biruni's extract from Varâhamihira's Samhitâ dealing with the same subject, he remarks that, given the very considerable number of discrepancies between the Arabic and the Sanskrit texts, 'Al-Biruni and his Pandit may not have read their manuscript with sufficient accuracy', it is worth while to ask ourselves carefully, whether he is right in putting so many question-marks in his translation[3]

Patheśvara in Al-Biruni's Vâyu-list cf Śatapatheśvara in the printed Vâyu-Pur (I 45, 110) which may be explained as originating in *sahapateśvara-* (cf Brnd Pur Pû Bhâ 16, 41 *sahapataccarâh*) Kisadya Kisasna, Kisasta, Kisajya Vâ Pur As to the Arthayâsavas and Puhlingas, instead of these names the Vâyu text has *atha pârśve tilangâs ca*, which is doubtful because the Tilangas are mentioned as a Southern people in the Mârk Pur 58, 28, with good reason doubtless, because the name will be the same as Tailanga, that is Telinga, the Telugu country[4] As especially with regard to the first name, the other texts have different forms, part of which seems to be mistaken, it is possible that Al-Biruni read in his source what we find in the Arabic text

A similar remark may be made with regard to Mashaka and Mudrakaraka Prâtragira, however, seems incorrect, we expect Antargiri or Antargirya, given by many texts Prathanga corrupt? Instead of Malada (Brnd -Vâ) the famous Mâlavas seem to have crept in The form Mâlavartika is also found in the Brahm Pur (Malavartika Brnd, Mâlavartin Vâ)

Instead of Ābîka all parallel texts have Videha, which is correct Govinda Vâ Gonarda Brnd, Matsya-Pur The first six names of peoples in the South exactly correspond with those found in Vâ (Cola Brnd, Mats) Al-Biruni may have read Rumana, because there are many variants Kumana Vâ, Kumâra Brahm etc Mahiṣa Mahiṣika Brnḍ, Mâhisaka or -ika the other texts Ishîka cf.

[1] XXIX, p 150, I, pp 299f [2] Sachau, o c., II, p 335
[3] See also Kirfel, Kosmographie, pp 71ff
[4] F. E Pargiter, The Mârkaṇḍeya Purâṇa, translated (Calcutta, 1904), p 267

Haisîka Brnd, Caisîka Vâ etc (sandhi!) [1] Šavara, like Mârk ca *Varâś ca* Vâ, Sarava Brnd The parallel texts give Pulinda, the Jaina canon, however, knows these mlecchas also as Pulindras,[2] which is (erroneously?) read by Vâ Vindhyamûli -îka Vâ, -maulîya Brnd Mûlika Maulika Brnd and other texts, Maunika Vâ, Gar Pur (55, 10ff) has Mûlaka Naitika Naisika Mârk and Nairnika Vâ after Bhogavardhana Udbhira Udbhida Vâ, Mârk, Ulida Vâm Pur It seems that Al-Biruni has erroneously split up Nalakalika (Vâ) into two names the Javanese Brnd Pur, however, has Nalaka (142, 18) [3] The two following words (not marked in Sachau's translation!) are clearly mistaken Vâ (128) has *dâksinâtyâs ca vai deśâ* '(these are) the countries of the Southern region' Here, the Iranian scholar adds the peoples of the West to the Southerners It must be remarked that the Javanese Purâna mentions the following peoples in the Western borderlands of the Dekhan (Daksinapatha) which tallies with the fact that some of them are expressly said to dwell in these regions The country of the Sûrpâkâras e g, was, according to the Mahâbhârata (2, 31, 65, 3, 88, 12, 12, 49, 66f) in the South, and near the Southern sea in the Western region of India [4] Again the name Tillîta, which I have not met with elsewhere, corresponds with a variety of forms in the Sanskrit texts (Kâlîtaka Vâ, Kuntala Brnd etc), so that Al-Biruni may have read it Similarly, Krâla Al-Bir Surâla Vâ, Kirâta Brnd, Sirâla Mats Rûpaka is found in Brnd, Vâ has Rûpasa, Tâmasa in the Vâmana-Pur Tâpasa Vâ, Tâpaka Brnd Tarûpana Turasita Vâ, Karîti Brnd and other forms Karaskara is, as Kâraskara, found in Mats Paraksara Vâ and other forms in the other texts Uttaranarmada also Mark 51 Antaranarmada Brnd-Vâ The erroneous form Bhânukaccha is read in the printed Vâyu text Bhârukaccha Mats Sârasvata Brnd, Mats etc Śâśvata Vâ Hudvuda, which I have not found elsewhere, is probably mistaken, the Sanskrit texts have Arbuda, which is correct In the following paragraph, which mentions the peoples in the West, Al-Biruni has united part of the inhabitants of the Vindhya Mountains and part of the Mountaineers (*parvatāśrayinas*) [5]—two categories distinguished by the Sanskrit texts—into one group

The form Malada is also given by Brnd Mâlava (Vâ, Mats) is no doubt correct, but it was, I think, not read by Al-Biruni Basârna may have arisen from a confusion of characters in the

[1] See also Pargiter o c, p 334

[2] I refer to Kirfel Kosmographie, p 227

[3] Old-Javanese Brahmanda-Purâna, ed by J Gonda (Dutch title and introduction, Batavia, 1932)

[4] See also Pargiter, o c, pp 338f

[5] Called the countries on the flank of the Himâlaya according to the Javanese text (143, 1).

Arabic manuscript-tradition all Sanskrit texts have the well-known name Daśârna Instead of Tosala and Kosala, given by the Sanskrit texts, Al-Biruni, like the Javanese Purâna, gives (or found?) only the last name Instead of Tharpura Tumbura Vâ and Mats have Tumura Tumbura, Brnd Tuhunda Barbara, Brahma-Pur Tumbura (Tu)Cara etc As Tumura and Tumbura are in all probability two names for the same tribe or group of tribes or, rather, two variants of the same name,[1] a text which, like Vâ, gives Tumura and Tumbura, does not seem to have preserved the correct tradition Instead of eleven peoples in the parallel Sanskrit texts, Al-Biruni mentions only two, Shattumâna and Padha, which do not tally with any of the variants found there The next name, however, is as good as identical with Karnaprâvarana (Brahma-Pur) in Brnd, Vâ etc the first part of the word differs Hûna as Hûna only in Vâ Sahûhuka (Brnd) and Sahûdaka (Vâ) might indeed be interpreted 'and the Hûhukas', but I have found no such name elsewhere Tâmara Brnd, Jav Tâmasa Vâ As to the peoples in the North Al-Biruni has split up the name of the Vâtadhânas (Vâdhadhâna Vâ 115), who are also mentioned in the Mahâbhârata, into two names Aparânta Brnd etc Aparîta Vâ The correct form Pahlava has only been preserved by Al-Biruni and Vâ Pur (var the text has Palinava) Madhra read Madra, this is the name of a well-known people,[2] which is given as Madraka by Mârk and other Purânas, whereas Vâ erroneously reads Bhadraka and Brnd Mandala

Šaka, Drihâla may have been in Al-Biruni s source, since the other texts give a variety of forms the Šakas are no doubt meant together with another people Litta cf Lahttha Vâm Pur After 10–16 other items Vâ has Pahlava and Bâhyatodara (*pahlavâ vâhyatodarâh*), probably erroneously, to which correspond other expressions in Brnd, as the Iranian scholar gives only five syllables, he has, in all probability, misunderstood his source Bharadva (not marked by Sachau!) must be Bharadvâja Jângala appears in Matsya-Pur (114, 43, after Saimka which corresponds to Sûlika in the Arabic text), Brahma-Pur and other sources Daśerakas or Dâśerakas are mentioned in other texts[3], Kaseruka (Vâ) is erroneous Tâlakûna Tâlaśâla Brnd, Talagâna Mats, Stanapa Vâ Sûlka Culika Mârk, Bhûsika Brnd and many other variants elsewhere, but further on Mârk (41) has Šûlika which is probably

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[1] See J Gonda, Tumura s en Çavara's, in Bijdragen tot de Taal-, Land- en Volkenkunde van Nederlandsch-Indie, 90 (The Hague, 1933), pp 167ff As to the 'variation -m- -mb- in Munda languages see now also F B J Kuiper, in Orientalia Neerlandica, A Volume of Oriental Studies, published under the auspices of the Netherlands' Oriental Society (Leiden, 1948), pp 372ff, especially p 383

[2] See also Pargiter, o c, pp 315f

[3] I refer to Pargiter, o c, p 321

correct[1] Jâgara, which I have not found in the Sanskrit texts, may correspond to Jâguda (Mârk 40), Juhuda (Vâ 113) So, many names in Al-Biruni's texts, which puzzled Sachau, can be explained

Let us now consider the list of names which Al-Biruni took from the Samhitâ of Varâhamihira[2] In a number of places the Iranian scholar has, indeed, erred in wrongly dissolving compounds Sâlvauî Pojjihâna instead of Sâlva, Nîpa, Ujjihâna, Meru (a well-known name, often found in his work), Kanastharâjva instead of Meruka, Nastarâjya ('the Kingdom of the Dead') etc But could it be expected that Al Biruni should know or interpret all these names correctly, which have often been inaccurately understood by native authors? Then, there are minor discrepancies Phalgulu Al-Bir Phalgulukâ Var etc Twice the order of the names is different §5 after Kapila six names have been moved from their place and put at the end of the paragraph, and, §3 Purika Dâśârna Var Five times a country, mentioned by Varâhamihira, is missing in the Arabic text §1 before Manu Samkhyâta, which is, however also missing in the Parâśara text quoted in Bhattotpala's commentary, and Pargiter, in his commentary upon the parallel Mârkandeya text,[3] says that Ghosasamkhya (Mârk has a different order of names here) may mean 'those who are reckoned among Ghoshas or herdsmen' and be an adjective to Khaśas So the absence of this word in the Arabic text may be due to deliberation Mâdhyamika, after Matsya, is also missing in Mârk like Gavva (before Yaudheya, §8) Pahlava, at the beginning of §5, and the mount Ksurârpana (after Vanaugha, §6) are, on the other hand, present in Mârk After Śaka (§6) where Mârk adds twelve names which are unknown to Varâhamihira's text, and Parâsara mentions a number of other names, Al Biruni gives 'Mleccha, i e the Arabs' We now come to those names which at first sight may seem faulty Gaja (§1) may be the result of a literal interpretation of Var 's Gajâhvaya (14, 4) 'the town called after the elephant', i e Hastinâpura as 'the town called Gaja Tulya (§2) (or Padmatulya?) Mâlyavat Var, Mânava Mârk, ? Krîrasamudra which is of course, corrupt Ksîroda-samudra Var, Sâmudra Mârk, Colika Cedika Var, Cedi Mârk, ? Ûrdhakarna agrees with Mârk -kantha Var Sairikîrna (§4) the commentary, quoted by Kern, reads Sairikîrna (sairi is in part of the manuscripts) and takes this for one word Saurikîrna Kirfel Sauris Kîrnas Kern, Śailika Mârk Tankana Kankana Kirfel, p 84

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[1] See Pargiter, o c, pp 323f

[2] Cf the text in Kern's edition The Brhat Samhitâ of Varâhamihira, Bibl Indica (Calcutta, 1865) ch 14, pp 87ff, the translation by the same scholar in J R A S, 1870, pp 81ff (= H Kern, Verspreide Geschriften I, The Hague, 1913 pp 234ff), and, moreover, Kirfel, Kosmographie, pp 81ff, who made use of another edition of Varâhamihira's work viz Sudhâkara Dvivedî (Benares 1895)

[3] Pargiter, o c, p 351

(which is read by one MS) Tankana Var text Kauverya: the river Kâverî in the Sanskrit texts Jarmapattana is mistaken, but Mârk has Carmapattanivâsinah Dharmapattana Var Instead of Krsnavellûra (Var) the Arabic text reads Krsnavaidûrya which is a 'sanskritized' form of the same name, Var MS G has Vaidûra Šibika is also read by MS D, the other Var MSS have Piśika or Pisika, as Mârk has Šûryâdri agrees with Mârk s reading and most Var MSS, as far as Kern saw Dîvârśa the Var MSS give a variety of readings *devarsi* A, *vaisâryaka* S, *carthakarsaka* C etc, Par seems to have read *Ā*(?)*vervâruka*, Kern interprets Cerya, Âryaka Kravya all Var MSS, except A (*kravyâdân*) read *kravyâkhya*- Dramida like one Var MS [1] Dravida Var Mâraka Mâkara some Var MSS, Mârgara other MSS Karnaprâvarana is read by some Var MSS [2] Mathara this is no doubt the Western people mentioned as Ramatas, Ramathas, Râmathas in Mats (113, 42), Mbh (3, 51, 25 etc) and, as Mâtharas, in Mârk 57, 37 Târakruti Târaksuti two Var MSS [3] In §8 Giri is due to a misinterpretation of Var 24 *himavân vasumân girir dhanusmâms ca* '(In the North lie) the mountains Himâlaya, V, Dh' Agnîtya is read by the Var MSS except two Šātaka like Mârk and many Var MSS Instead of *abhisâradaroda*- (Var 29) the Arabic text reads Abhi, Šârada (haplography) Râstra must be Vanarâstra 'The Kingdom of the Woods' Palola see Kern,[4] Nandavistha (instead of Divistha) dittography Puñjâdri, like four Var MSS Muñjâdri a well-known mountain

So, on the strength of a critical examination of these lists we refrain from imputing to Al Biruni such a lack of accuracy in this matter as might be suggested by Sachau's remark Some of his readings are even of value to those scholars who apply themselves to the study of Puranic traditions Although the results of a thoroughgoing comparison of all texts used by the Iranian author are not always abundant,[5] Sanskrit philologists as well as Al-Biruni students may be interested in them

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[1] Kern, Verspreide Geschriften I, p 235, n 12

[2] See also Kern, o c, I, p 235, n 11

[3] See also Pargiter, o c, p 372

[4] Kern, o c p 237, n 1

[5] I refer to my remarks on Al-Biruni's quotations from the Bhagavadgîtâ, to be found in my paper 'The Javanese version of the Bhagavadgîtâ' in Tijdschrift voor Indische Taal- Land- en Volkenkunde, 75 (Batavia 1935) pp 36–82, esp pp 48–51

THE ADVAITA DOCTRINE IN ALBERUNI

By

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Alberuni was one of the most learned Muhammadans who entered India during the Afghan period, if not the most learned of all He was an astronomer and a philosopher, and, as befits a man of learning, he was wise enough to study and appreciate the opinions and beliefs of other people His travels through India gave him a good opportunity to study things Indian, and the account he has left to us of his Indian studies is not the hurried narrative of superficial impressions of the average modern traveller through the East It is a conscientious, deep, well-reasoned and scholarly treatise concerning all important subjects prominent in India in those days He mentions a number of Indian authors and books, like the *Mahābhārata*, the *Rāmāyana*, the *Bhagavad Gītā*, the *Brhadsamhitā* of Varāhamihira, the *Mātsya Purāna*, the *Visnu Purāna*, the *Vāyu Purāna*, the *Manusmrti*, Patanjali, the *Brahmasiddhānta* of Brahmagupta, the *Sāmkhya Sūtras* and others from which he quotes freely, with sympathy and understanding, in a very scholarly way, as behoves a learned man who takes pleasure in acquiring new knowledge staying above all petty feelings and religious scruples

None of the Vedāntic authors is ever mentioned by Alberuni, yet while delving into the nature of God he clearly explains the foundation of the Advaita School [1]

On this point he writes as follows 'They consider the unity of God as absolute, but that everything beside God which may appear as a unity is really a plurality of things The existence of God they consider as a real existence, because everything that exists exists through him It is not impossible to think that the existing beings are not and that He is but it is impossible to think that He is not and that they are' [2]

Alberuni's first statement may appear somewhat confusing to those who know the mind of the ancient Indian sages The latter clearly say that this plurality of things by which we are surrounded is but an illusion for one who does not see anything else beyond, but

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[1] In ch II

[2] Sachau's transl, I, p 31

all these diverse things lead the wise to see the ultimate Reality which is behind them all

'There is on earth no diversity
He gets death after death,
Who perceives here seeming diversity
As a unity only is it to be looked upon--
This indemonstrable, enduring Being,
Spotless, beyond space,
The unborn Self, great, enduring
By knowing Him, only a wise
Brahman should get for himself intelligence'[1]

Though contradictory in appearance, Alberuni says absolutely the same The world is really 'a plurality of things', there is no doubt about it, yet all this plurality 'may appear as a unity' How? To him whose mind is trained That is the reason of that *Upanisadic* prayer

Tamaso mā jyotirgamaya.[2]

To look at the things of the world and not to rise from them to the Supreme Being, is not human, animals also see them all For our intellect tells us that all these things are transient, passing, fleeting, appearing and disappearing in a continuous flux, the *samsāra* of Vedic literature, and all of us with them And they, being so, cannot exist without a foundation Because being transient they do not in reality exist "How can that be a real thing," asks Socrates in one of the platonic dialogues, "which is never in the same state?"[3] For existence means steadfastness, steadiness, immobility, unchangeability Such is the existence of God, through whom everything else exist Hence Alberuni adds 'The existence of God they consider as a real existence, because everything that exists exists through him' He is therefore *Satyasya Satyam* the motionless rock upon which the whole universe is founded according to those words of David 'He is my rock and my salvation'[4]

Alberuni says that 'this is what educated people believe about God', for whosoever does not see this One Reality beyond the diversity of things, is not properly educated, and lacks something which is essentially human His life is totally wasted

As water rained upon rough ground
Runs to waste among the hills,
So he who sees qualities separately
Runs to waste after them

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1 *Brhadāranyaka Upanisad*, IV, 4, 19-21 (Hume's, p 143)
2 *Ibid* I, 3, 28 3 Plato, *Cratylus*, 439 E 4 *Ps*, LXI, 7

As pure water poured forth into pure
Becomes the very same,
So becomes the very soul, O Gautama,
Of the seer who has understanding [1]

For 'the perfect man is not aware of anything than God, his own higher self' [2] One who has acquired this mystical knowledge, one who sees One only in the midst of the diversity of the universe, owing to his intellectual training, sees God in all and all in God, which is a very high attainment in the life of man Once more the *Bṛhadaranyaka Upanisad* says 'It is as, when a drum is being beaten, one would not be able to grasp the external sounds, but by grasping the drum or the beater of the drum, the sound is grasped It is as, when a conch-shell is being blown, one would not be able to grasp the external sounds, but by grasping the conch-shell or the blower of the conch-shell, the sound is grasped It is as when a lute is being played, one would not be able to grasp the external sounds, but by grasping the lute or the player of the lute, the sound is grasped' [3] St Paul in his epistle to the Romans had also repeated the same, idea 'The invisible things of Him, from the creation of the World are clearly seen being understood by the things that are made' [4]

Alberuni proceeds to give the reason why God is the Real Existence, while creatures exist only through Him 'It is not impossible' he says, 'to think that the existing beings are not and that He is, but it is impossible to think that He is not and that they are' Alberuni's statement is very bold but it is philosophically true While he explains the theological ideas of ancient Indians, he is able to think of the existing creatures as not existing, for they actually began to exist one day, consequently they did not exist before, just as it is possible to think that God exists, but it is not possible and is totally absurd to think that He is not for he is the Necessary Being Self-subsistent, *Svayambhū* The *Bhāva Vrtta* of the *Rgveda* after describing the nothingness that existed before the Creation describes Him as existing by his own power

Ānīt avātam swadhavā tat ekam [5]

Such a Being is the Existing one One, indeed, like whom no other being exists And that is the reason why God Himself gave to Moses the description of His existence as his most proper name Some may call him the Infinite, the Omnipotent, the Omniscient,

[1] *Katha Upanisad*, IV, 14–15
[2] Tyāgiśānanda, *Aphorisms on the Gospel of Divine Love*, p 67
[3] *Bṛhadāranyaka Upanisad*, II, 4, 7–9
[4] *Rom*, I, 20
[5] *Rg*, X, 129, 2

the Merciful, the Changeless One, but He called Himself, 'He who exists' [1] Very wisely therefore the early Proto-Indians styled Him *Iruvan*, 'the One who is' [2]

The human intellect cannot easily grasp the real import of the divine existence, for it has no other standard of existence to compare it with than the existence of the creation, and yet if He is the One who exists, the Universe does not exist as He is

'Not by sight can one obtain Him,
Nor yet by speech or by the mind,
Except by one who says 'He is',
How can He be experienced?
He should be apprehended as 'He is',
And by his real nature in both ways
When He is apprehended as 'He is',
His real nature is made manifest' [3]

The ancient sages nevertheless fully acknowledge this difficulty—nay this impossibility without his *prasāda*—of understanding the nature of God 'He is incomprehensible, for He cannot be comprehended' [4] On this account says Krsna in the *Gītā* 'I know all beings past present and future, and no one knows me' [5] And in the same strain Vāc says in the *Rgveda*, referring precisely to the unilateral relation of the creatures to the Creator 'Whosoever eats food he eats it through Me, those who see, breathe or hear the spoken word, through Me see, breathe and hear They do not know it, but they live through me' [6]

God therefore, though man cannot fully understand it cannot but exist, and since the world may one day not exist, the existence of the world is entirely different from the existence of God Hence we may boldly say that the world does not exist, which is the contention of Śankara and his advaitic school, enclosed as if by magic in that brief formula, pregnant with the most salutary thoughts, which nevertheless has so very often been misunderstood *Ekameva advitīya* 'He is one without a second', i e having no other like Him He is not the first in a numerical series, for the world belongs to a much inferior category He constitutes a category by himself, transcending all yet immanent in all, for He is *angustha mātra purusa*, the person of the size of a thumb, indwelling in the lotus *mahāl* of man's heart, the silent, all-knowing *antaryāmin*

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[1] *Exod*, III, 14

[2] Cf Heras, 'The Religion of the Mohenjo Darians according to the Inscriptions' *Journal of the University of Bombay*, V, p 3

[3] *Katha Upanisad* VI 12 13, Cf *Kena Upanisad* 3, *Mundaka Upanisad*, III, 1, 8

[4] *Brhadāranyaka Upanisad*, IV, 4, 22

[5] *Bhagavad Gītā*, VII, 26

[6] *Rg*, X, 125, 4

The person who has trained his or her mind to see God behind all the creatures of the world, who sees God in all and all in God may really be called *Brahma drsti*, who 'sees everything under the form of eternity',[1] where there is no change at all Such a person is already enjoying the beginning of eternal bliss, as far as it may be enjoyed in this world, for he has found the peace and tranquillity of God in the solitude of his mind 'He to whom all things are one, he who reduceth all things to one and sees all things in one, may enjoy a quiet mind and remain peaceable in God'[2]

Alberuni visited India and studied her ancient wisdom with that open mind and with that desire to acquire knowledge, which adorned that intelligent envoy of old, spoken of by Jalālu'd-dīn Rūmī, who was sent to India by an ancient Iranian King to find the Tree of the Water of Life[3] And he was as successful as his prototype

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1 Srinivasachari, *Studies in Vedanta*, p 49
2 Kempis, *The Imitation of Christ*, I, 32
3 Jalālu'd-dīn Rūmī, *Mathnavi*, II, 3641-3680

AL-BĪRŪNĪ'S CONTRIBUTION TO COMPARATIVE RELIGION

By

PROF DR A JEFFERY

The importance of al-Bīrūnī's contributions to the more strictly scientific disciplines has tended to obscure the fact that he stands unique in his age, and perhaps unique in the history of his own faith, for his contributions to the study of Comparative Religion It is true that he had a good tradition in which to stand It Comparative Religion means the study of Religion by the same scientific method as is used in Comparative Anatomy or Comparative Philology, viz the assembling of facts about the beliefs and practices of various religious groups, arranging them, classifying them, comparing them with one another and with the beliefs and practices of one s own religion, in order to arrive at a better understanding of the significance of religion, then this branch of study had already had a long history in the area of al-Bīrūnī's life work

As early as the cuneiform tablets of Mesopotamia we find documents showing a lively interest in the facts of religious belief and religious cult ceremonies connected with the religious life of the various centres of that ancient world, and giving an abundance of materials accompanied by elements of critical appraisal and comparison With the Greeks there was even more interest in describing the religions of other peoples and comparing them with the relevant phenomena in Greek religion, an interest which they in turn passed on to the Romans In the Classical writers there is even some theorizing on the origins and the development of religion The ecclesiastical writers of the succeeding centuries, both those living at the eastern end of the Mediterranean and those in the Provinces further East, show an even more lively interest in Oriental religions, and the fact that their attitude is now very largely polemic ought not to obscure recognition of the value of the great amount of information they give us about these various religions against which their polemic is directed Indeed their copious quotations from the writings of their adversaries are often the only direct information we have about some religions which were living then but have since passed away

Islam in its turn took up this tradition Just as the Christian writers who deal with these other religions were at first interested mostly in heretical movements within their own community, so Muslim writers in this field are at first interested more particularly in what we may call the Muslim heresies Yet even al-Ash'ari (*d.* 953) in his *Maqālāt al-Islāmiyyīn* is interested in the views of non-Muslim dualists and in those of the Christian communities,

and was known to have composed a work in which he refuted the teachings not only of Jews and Christians, but also of the Hindus and Zoroastrians The interest of Jāhiz of Basra (*d* 869), of Ibn Hazm of Cordova (*d* 1064) and of the Shī'a writers an-Nawbakhtī (*d* 912) and Ibn Babūya (*d* 1001), in other religions and sects, is almost wholly polemical, but in the historians such as al-Ya'qūbī (*d* 890) and al-Mas'ūdī (*d* 956), there is evident interest in recording the facts about the religions of surrounding peoples without any special polemic intent, while in the works of the encyclopaedists such as the *Fihrist* of an-Nadīm (*c* 990), or the *Bayān al-Advān* of Abū'l-Ma'ālī (*d* 1092), the interest is so frankly in the religions themselves that the authors tended to come under suspicion of not being very good Muslims

It is in this tradition that al-Bīrūnī stands He also is aware that he risks the censure of the orthodox Muslims for his interest in these other faiths and is at pains to defend himself He was well aware that there was a considerable literature on the subject in Arabic, much of which he himself had read Occasionally he refers to the work of some of his predecessors in this field, to Abū Ma'shar al-Balkhī (*d* 885), the great astronomer known to Europe in the Middle Ages as Albumaser, who, he says, wrote an important work on 'Houses of Worship', to Abū Ya'qūb as-Sijistānī, the Isma'īlī writer who was executed at Bukhāra in 942, and whose *Kashf al-Mahjūb* contained an account of the various doctrines of metempsychosis, to one Zarqān, unknown to us, who had written about Buddhism His chief reference, however, is to a work by Abū'l 'Abbās al-Iranshahrī who not only set forth the facts about the religions with which he was dealing without prejudice, but took care to go to the Scriptures of these various religions to document his statements, and who always supplemented the information he gained from writings by personal questioning of the common folk who were adherents of these various faiths

METHODOLOGY

When al-Bīrunī is discussing the religion of the Jews or the Christians of his day, the Greeks or the Zoroastrians, the Hindus or the Buddhists or even the religion of the Manichaeans, he is dealing with matters on which we have today source material much superior to that which was available to him For this reason, while what he has to say about these religions has considerable interest for us, our main interest today is in his methodology

He tells us that he was led to write down his observations on the religious customs and beliefs of the Hindus, at the insistence of Abū Sahl of Tiflis, on the ground that he discovered that most of the available literature on the subject of the non-Muslim religions sadly misrepresented those religions, both because of inadequate

acquaintance with source material, and because of a highly prejudiced attitude towards the religions they were describing. Al-Iranshahrī was an exception, perhaps because he was a sort of religious syncretist who had a fancy religion of his own invention, but at any rate in his book he was not satisfied with the popular method of uncritically copying out information from second-hand sources, but went to the Scriptures of the various religions, and consulted where possible living adherents thereof, so that he was able to give a good account of the ancient religions, of Judaism and Christianity, and in particular of Manichaism, and even of contemporary Hinduism and Buddhism, though here he was led astray by placing too great trust in the writings of Zarqan. On the whole he has a poor opinion of most of his predecessors, but he thinks that it is possible to give an adequate account of other religions, and a fair and unbiassed description of their beliefs and practices, if one follows the right method. Fortunately, both in his *India* and in his *Chronology*, he has a good deal to say about matters of method in such investigation.

His method is the comparative method. He mentions this expressly in opening his discussion of the various systems of time-reckoning (*Chron.*, 4), and again in connection with marriage customs (*India* 53). No amount of skill in philosophical deduction or induction from the evidence of our senses can ever lead to correct notions on the religious institutions of peoples. It is only by collecting their written traditions on these matters, and enquiring from the people themselves, that we can form a basis for understanding. Then, by comparison of the traditions and opinions of one group regarding a certain institution with the traditions and opinions of other groups, we shall bring out similarities and contrasts, and gain just ideas as to relative values and the relative superiority of one system to another. This he illustrates in *India*, 12, by a comparison of Greek thought and thinkers with Hindu thought and thinkers, not, he reminds us, in order to correct either one of them, but to confront them with one another so as to make it possible to draw some conclusions from the comparison. It is thus that we must proceed, from the near at hand to that which is more distant, from the known to the unknown, beginning always with the collecting of traditions and reports from the people themselves so that if we do not attain to all that we desire in our study we at least leave accurate, assured information for those lovers of truth and wisdom who may come after us, and who perhaps, building on our foundations, may attain what has been denied us.

The comparative method however, if it is to have reliable results, must conform to certain fundamental principles of investigations, the careful observance of which is our sole means of minimizing error.

(a) Completeness

Comparisons made on the basis of an inadequate assemblage of material may lead to quite erroneous conclusions. Therefore we must make every effort to gather as complete an array of facts on each matter under consideration as possible, and refrain from comparisons where our material on hand is inadequate. Thus he himself, in the matter of the months observed by the Tibetans, Chinese, Negroes, Ethiopians and others, though he has found out something about them, judges that it is best to postpone discussion of them till his information is more complete, for otherwise, he says, he would be going contrary to his method of refusing to connect the doubtful and unknown with the certain and known (*Chron.*, 68). It is true that in his work the actual statements he makes as to the length his investigations have gone, and his confessions of the inadequacy of his knowledge, are generally in connection with more strictly scientific matters, but we may assume that the same care for completeness would characterize his investigation of matters of religious interest.

(b) Accuracy

Comparisons can be of little use unless the material on both sides of the comparison is set forth not only completely but accurately. In the case of religion this is a peculiarly difficult problem. If we take any religious practice, say Prayer, it is obvious that a comparison of methods of prayer used among Hindus, Greeks, Buddhists, Jews, Christians, Manichees and other groups, would yield valuable insights into the nature of prayer as a cult act and as a practice of individual piety. Yet actually we find that the problem of securing accurate descriptions of the practice of prayer in the different groups is a serious one. Al-Bīrūnī tells us that in his investigation of such points he found too often that the material in the authors he consulted was hearsay and not precise information. Hearsay has its advantages, since in the form of Tradition it can continue to tell us of times that have passed away (*India*, 2), but it has its evident drawbacks, and in his discussion of festivals (*Chron.*, 330) he takes occasion to give point to his scepticism of statements based only on the authority of popular story-tellers. No pains must be spared, therefore, in the attempt to attain accuracy. So in dealing with Hinduism, he tells us (*India*, 4) that he will place before the reader the theories of the Hindus exactly as they are, and where there are similar theories among the Greeks, or in the teachings of the Christian sects, or the Sūfīs, as for example in the matter of the transmigration of souls, or pantheistic doctrines of the unity of God with His creatures, he will accurately report their theories also for comparison.

There is always the problem, of course, of which authorities one is to use for one's report on any particular matter, for not infrequently there is one set of religious ideas current among the educated, but quite another among the uneducated (*India*, 15), so that those of one group may stoutly maintain that the views of the other group do not really represent their religion (*India*, 54) For this reason he is careful to note in his reports whether he is reporting the popular or the educated-class belief or practice, where it is possible to make this distinction

It is not always possible to consult living authorities, for some religions belong to the past and have no modern adherents, and some are professed in distant areas with which one has no means of direct contact In these cases it is necessary to depend on traditions which have been handed down in writing Written records are also a useful check on what one hears from living sources of information Often enough these living sources of information are just foolish people who tell the enquirer tales which they think will interest him, but which do not really represent the teaching of their religion, and this can be checked by written records Often the enquirer finds that the religious leaders of a group are unwilling to give information to one not of their faith He mentions in particular the unwillingness of Hindu savants to impart to any foreigner information about their teachings (*India*, 11) Books, however, are generally more available, and if the investigator can procure them and takes care to quote from them copiously and accurately he may avoid the charge of having used material that is inaccurate because picked up from hearsay (*India*, 13, 247)

The use of documentary evidence, however presents problems of its own to the scholar who is interested in accuracy

(1) There is the preliminary difficulty of understanding correctly and reporting accurately teachings of sects whose whole system of thought is foreign to one's own, and whose practices in many details present elements completely strange to the observer This difficulty is there even when reporting from the living informant whom one can question about things one does not understand, but the situation is doubly difficult when documents are the sole source of information He illustrates this from his own difficulties with Hindu thought (*India* 9) where not only is it true in general that the Hindu mind seems to differ from the Muslim mind in every respect (*India*, 10), but in particular, in problems such as that of the classes of created beings (*India*, 43), it seems impossible for a non-Hindu really to penetrate their

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thought and look at these matters from their point of view, seeing them from within

(ii) Then there is the difficulty that the sources themselves are often lacking in scientific precision in their descriptions of their own religious beliefs and customs (*India*, 43) Sometimes this is because these matters are so familiar to them that they do not see that their descriptions are inadequate for others not born into their tradition, and where means of clarification are not available this may be a serious defect Even his predecessor, al-Iranshahri, for whom he had high praise, went widely astray in his account of Buddhism through having to depend on the inadequate information given in the written source he was using, (*India* 4). For this reason he insists that the writer of a comparative study must himself take great care about the wording of every sentence he writes lest from some misunderstanding of his words wrong conclusions be drawn from his comparisons His illustrations here (*India*, 15) are interesting / He refers to the Hindu philosophical statement that God is a *point*, by which they mean that the qualities of bodies do not apply to Him, yet some uninstructed person reading or hearing this jumps to the conclusion that it means that the Hindu teachers claim that God is as small as a point, to offset which absurdity they immediately indulge in greater absurdities Or maybe someone coming upon the statement that God so comprehends the universe that nothing therein is *concealed* from Him, jumps to the conclusion that God must have eyes, and as one eye or two eyes obviously would not suffice to embrace all in our universe they will describe God as having a thousand eyes Care must therefore be taken in examining the statements to be found in the documents at one's disposal

(iii) To these problems must be added that arising from the difficulties of language The books of the Jews and Christians, of the Greeks and Hindus, are in foreign languages in translation from which lurks many a possibility of error There may be error in the understanding of words in these books, and there may be error in the rendering of them He goes into some detail (*India*, 9) in describing his difficulties with Sanskrit Its enormous vocabulary, of which the Hindus are abnormally proud but which is really a

defect, is a primary difficulty Hardly less important, however, is the fact that the Indian phonology is so different from that of Arabic that it in itself can be a constant source of error In *India*, 214, he points out how some of his Muslim predecessors had fallen into sad error through their misspelling of Indian words which they thought they had got right but had not Then he discovered that in India there were always two languages, a classical and a vernacular, so that to learn to speak with the people and gather their ideas about their religion was one thing, but to understand the highly ornate language of the texts, with its niceties of grammar and of rhetoric, was quite another thing Added to this was the fact that in order to facilitate the memorizing of texts there had grown up a custom of composing them in verse, a proceeding which resulted in the language of such texts becoming strangely artificial and strained, and increasing the difficulties of the foreigner desirous of understanding the texts (*India*, 10, *Chron* , 337)

(iv) Finally there was the ever present difficulty of textual corruption Not all scribes are careful, and some are almost unbelievably careless Yet in dealing with documents we are always dependent on the transmissions of scribes If the scribes are careless in transcribing and do not prepare properly collated copies, even a good author becomes practically lost by reason of their negligence Indian scribes in particular he found to be guilty of gross carelessness (*India* 9) and a like carelessness on the part of some Muslim scribes has caused further corruptions in the transmission of the Arabic translations of many works It is curious to note how often in dealing with individual points of his exposition we find him complaining of textual corruption (*India*, 76, 77, 112, 235, 240 313, *Chron* , 84) Where we are dealing with translations there is the further source of textual corruption in the unwarrantable liberties some translators take with their texts omitting, altering, misplacing transposing, glossing, in such a way as often to deform sadly the original text (*India*, 76)

c) *Unbiassed treatment*

Even where care has been taken to state the beliefs and describe the customs of other religions accurately and fully, the account may nevertheless be distorted by the biassed and prejudiced manner

in which it is set forth Al-Bīrūnī therefore insists that part of methodology is—

(i) The examination of witnesses to ascertain what value their evidence has

Some writers are satisfied with superficial information, (*India*, 3) which, though it may be correct enough so far as it goes and is set forth without obvious bias, nevertheless gives a distorted picture which is satisfactory neither to the adherents of the religion nor to the scientific investigator

Other reporters are full of animosities and antipathies, based it may be on national pride or personal predilections (*India*, 2, *Chron*, 4), and so report what certainly are facts, but facts distorted because they are directed to the laudation of this or the disparagement of that, and thus unreliable because so biassed Some indeed allow their antipathies to go so far as the wilful falsification of evidence to make it enhance this or detract from that.

There are still others who falsify evidence, not out of any feeling of animosity, but because of an innate delight in altering and embellishing all that comes into their hands (*India*, 2) Such writers would deny that this is distortion, but since they cannot resist their intellectual delight in improving on everything that comes to them, their evidence must always be suspect

Some, of course, falsify simply through ignorance (*India*, 78), mingling together things that do not belong together, confusing speculation with fact, misunderstanding the significance of things they have observed or have been told, and so while intending to report accurately and without bias, yet produce accounts that are unreliable

(ii) Criticism of evidence.

Examination of the witnesses will remove some sources of distortion but a further check may be imposed by the confrontation of reports This will often reveal that certain accounts, otherwise not under suspicion, are not free from confusions and mistakes (*Chron*, 322) One of al-Bīrūnī's complaints against his predecessors is that in their works he so frequently came upon masses of material unsifted by scientific examination (*India*, 4) Ya'qūb b Tāriq and al-Fazarī he found constantly misspelling Indian words, (*India*, 214) and so disfiguring them that their evidence could

never be accepted without critical examination Many authors, again, on even a slight examination, can be shown to have no independent value, since they are merely copying from others (*India*, 4), while sometimes by comparing the statements of writers it can be shown that on important points they have all gone astray through misunderstanding a source from which they have all drawn (*India*, 242) Though his particular objection to Ya'qūb b Tāriq in *India*, 219, that he failed to examine and check his sources, is in reference to a point of a scientific nature, his point of methodology here holds true for religious matters as well "Criticism is necessary, but it must be fair, so he states that he himself will always endeavour to give a clear exposition of all theories, basing his statements on the foremost authorities of their religious law, so as to expose the matter to fair criticism" (*India*, 112)

(iii) Unprejudiced presentation

Al-Bīrūnī is conscious of the fact that Muslim authors are far too prone to misrepresent the teachings of other religions, or even those of other sects of their own religion, when they come to write of them He had found this true in their accounts of the rationalistic Mu'tazilites (*India*, 3), and in the Introduction to his *Chronology* he also has to complain of the numerous lies he found mixed up with all the historical records (*Chron*, 5) Again in speaking of the work of Abū Ma'shar (*Chron*, 26), he takes occasion to refer to the foolish people who abuse all religions This unfortunate habit of allowing partisanship to enter into scholarly discussion he deplores because it makes even clear seeing eyes blind and clear hearing ears deaf, and pushes men into following paths that their intellects would bid them never follow (*Chron* 66) This reproach of prejudice is levelled not only against the uneducated, for even among the learned he has found that there are those so enamoured of their own theories, and so fully persuaded that they are much superior to others, that instead of examining evidence in an impartial spirit they wrinkle up their noses in a grimace of disdain, or laugh in mockery (*Chron*, 84) This defect is not confined, of course to Muslims He is able to quote a warning example of Brahmagupta's blind hatred and abuse of Āryabhata (*India*, 189), and the lies Syncellus tells about the Sābians (*Chron*, 205)

His method, on the contrary, will be to make no unfounded imputations against other religions even though its adherents are antagonistic to his religion (*India*, 7) The correct scientific method is to deduce the facts about another religion from the statements of its adherents, even if you yourself do not believe in them (*India*, 3) Such an investigator will set forth the ideas of these religions, not in order to refute them, but merely as an historical record of the facts (*India*, 3, 13, *Chron*, 332) Such, he says, his work on India will be He will place before the reader the various theories of the Hindus exactly as he finds them to be, and for illustrative purposes, to make them clearer and more intelligible, he will bring into connection with them such theories of the Greeks as he finds to be similar to them

One particular difficulty of presentation, he recognizes, lies in the fact that certain terms which are quite admissible in the thought world of one religion, e g the term *apotheosis*, are extremely offensive to people of another faith (*India*, 17), so that it is difficult to choose terms with which to present such a theory which will not cause undue prejudice in the mind of the reader of another faith, and yet will really do justice to the theory concerned

He is also aware that there will be objection on the part of some pious Muslims to the setting forth in detail many theories and practices which they regard as heathenish and objectionable Yet he claims that, since his purpose is to elucidate the subject, it is not inconsistent conduct for a Muslim to set forth the beliefs and describe the religious customs of others (*India*, 4) His account is to be descriptive, not polemical (*India*, 4, 112), for only so can his account win approval from all In his discussion of the Jewish and Christian methods for the computation of the Passover, he writes—

> 'Now, since it has been our object in all that has preceded thus far, to point out scientific truth, to mediate between the two parties, and to clear up the differences between them, we have here set down the methods of each of the two sects according to their own opinion, as well as that of others, so as to show to each of them what is for and what against the same Then from our side we have shown that we frankly adopt their statement, and lean upon their opinion, in order to make the truth clear to them In this we are guided by a desire that both parties should dismiss from their minds any suspicion that we are partial to either side or are dissembling that their minds should not shrink from our differing opinion, when we pass in review the Canons which they themselves adduce For if these are left such as they are they are not free from confusions and mistakes, most of which we have already pointed out' (*Chron* 322)

With obstinate people, of course, it is useless to argue (*Chron*, 68), for they will refuse to see the truth, but by carefully collecting the histories and traditions of former peoples that have come down to us from them, even though this at best gives us but *remains* of their customs and institutes, by comparing traditions and opinions with one another, by consulting the present adherents of the various religions and sects as to their current use of the various institutes of their faith, by correcting as far as possible all reports that come to us, and by removing from oneself any element of partisan spirit, it is possible to make a fair and unbiassed study of other religions (*Chron*, 4, 5)

He is not blind to the inherent difficulties, and indeed confesses that this is not an easy method to follow (*Chron* 5) He is aware of the difficulty raised by the problem of terminology (*India*, 17), and of the necessity of supporting his statements by good attestation (*Chron*, 14)—

> 'It is therefore preferable not to accept any account of a similar subject unless it is attested by a writing, the correctness of which may be relied upon, or by a tradition, the conditions for whose authenticity, according to the prevalent opinion, are well grounded '

Sometimes, of course, it is not possible to procure documentary attestation He mentions the case of the Khwarizmians, whose priests and learned men were all killed off by the conqueror Qutaiba b Muslim al-Bāhilī, and their books burned, so that presently they became quite illiterate, and being dependent on what could be handed down by memory they forgot all matters on which there was divergence, and remembered only those on which there had been general agreement

He is conscious also of the difficulties involved in dealing with documents even when they are preserved in some completeness He recounts his own diligence in procuring MSS from such places as he heard they were likely to be found, sparing neither trouble nor expense in collecting them With equal diligence he sought out learned native scholars who could teach him the language and explain to him their beliefs (*India*, 12) But then there was the trouble of translation, so he is at some pains to explain his own method of translating into Arabic (*India*, [illegible]) taking every precaution to be accurate and clear, and to give adequate explanation of all the terms he uses He tells us how he had made complete translations of two important works, the *Samkhya* a treatise on origins and a description of all created beings, and the *Patañjali*, a treatise on the emancipation of the soul from the bodily fetters, since these two contained between them most of the elements important for the study of Hindu thought (*India*, 4)

Sachau, in the Introduction to his translation of the *Chronology* (pp ix–xiii), has paid homage to the careful method of al-Bīrūnī, his hatred of all shams and his love of truth, his critical acumen, and the large measure of success he attained in setting forth the views of those whose systems he had studied That he did not quite succeed in his aim at impartiality, however, appears in many a passage of his books where he allows his regard for Muslim orthodoxy to sharpen his tongue, and especially in those passages where he lets us see all too clearly his deep seated aversion for the Arabs and strong predilection for all things Iranian

THEORETICAL DISCUSSIONS

Apart from his account of the beliefs and practices of the various religions with which he deals, al-Bīrūnī has also some theoretical discussion of certain general problems of religion

(*a*) *Idolatry*

No student of Indian religion could fail to be impressed by the ever present images of the deities and the daily worship offered to idols It is a problem of religion far wider than the area of Hindu religion Al-Bīrūnī thinks he can discover the origin of the practice of idolatry in the conditions of human nature Abstract thought is something beyond the attainment of the average man In any time or place there will be but a few select minds which can grapple with abstract thought The common man has a profound aversion to it and prefers to deal with the world of sensible things Thus religious leaders, not only among the Hindus, but also among the Manichees, Jews and Christians, have given pictoral representations of religious things so as to satisfy the mentality of the common people He thinks that even among the uneducated Muslims, if a picture of the Prophet, or of the Ka'ba, the sacred shrine at Mecca, were presented to them, their delight in seeing the picture would make them want to kiss it, fondle it, roll in the dust before it, as though in the presence of the real thing, imagining that they are seeing the original, not just a representation It was precisely this that led to the manufacture of idols The people must be taught to venerate certain persons or monuments connected with their religion But how can common people venerate them unless they can see some sensuous representation of them? Once this representation is supplied its origin is soon forgotten, and men come to reverence the representation as though it were the original (*India*, 53)

He knows that there are some theorists who claim that all mankind was involved in idolatry before God sent Prophets to reveal His truth to men (*India*, 54) Others thought that mankind began with the true religion but later fell into the error of

idolatry, and have their theories as to when idolatry was introduced. The Jews, he says, claim that it was first introduced in the days of Serugh, the great-grandfather of Abraham Here he would seem to be reproducing a tradition told him by some Jewish informant, for though the usual Jewish theory is that it was Enosh, who made the first idol by kneading together dust and clay into an image into which as he blew on it Satan entered and made it walk (Cf *Targum Yerushalmi* to Gen iv, 26 and the Rabbinic Commentators on the passage), yet the Jews agreed that Serugh was an idolator who taught his son the arts of the soothsayer and the magician (*Jubilees*, xi, 1–10) The Romans, he says, think it was introduced by Romulus, who made an image of the brother he had killed, while the Hindus have stories about idolatry being introduced by king Ambarisha in consequence of certain appearances to him of the god Indra (*India*, 54, 55), or by a Brahman named Nārada, who saw a divine image in the fire (*India*, 55) Idols, however, are only for the use of the uneducated, and he quotes the *Gita* to show that educated Hindus knew that no real representation could be made of God (*India*, 59).

The pagan Arabs, he tells us, worshipped idols because they thought that they would be intercessors with God (*India*, 59), and the Greeks considered idols as mediators between them and the First Cause, since this latter could not be addressed in worship The Greeks also knew the theory that an idol was only a remembrancer, a memorial erected in the first instance to commemorate the dead and be a consolation to the living, but later, when this origin was forgotten, idolatry became an abuse (*India*, 59, 60) The Caliph Mu'āwiya, he says, had this idea about the idols he found during the conquest of Sicily

(*b*) *Sunna.*

As a Muslim al-Bīrūnī was well enough acquainted with the binding force of religious custom (*sunna*), and its importance as normative for the lives of believers but in *India*, 275 he quotes with approval a passage from the Hindu *Saṃhitā* describing the reason why various matters are placed under religious sanctions In the case of ordinary usages men are likely to enquire into origins and analyse basal concepts and perhaps be led to abandon them, whereas religious commands are accepted on trust and not closely enquired into or argued about It is somewhat like the case he says, of people who were born in a land that was harsh and sterile and since they have never known anything else and that is their mother country, they love it, reverence it, and find it difficult to leave it So where things are placed under the sanctions of religion or religious law, attachment to them becomes *Sunna* and can never be rooted out.

(c) *Scripture*

Since the orthodox Muslim theory is that the Qur'ān is the final revelation, and the sole book that can claim to be in the absolute sense the word of God, it was inevitable that the Scriptures in the hands of the adherents of other religions should pose a problem for the Muslim theologians. Did these represent genuine transcripts of the revelations which had been sent down prior to the revelation of the Qur'ān to Muhammad, or were they but man-made collections pretending to be transcripts of these earlier Scriptures? Gradually an orthodox 'doctrine of Scripture' took shape among them. In his section in the *Chronology* on Ramadān (*Chron.*, 332, 333) al-Bīrūnī quotes one part of this orthodox theory of the Muslim divines, viz. that part of it which declared that all Scripture was revealed during the month of Ramadān—the *Suhuf* to Abraham on the first of the month, the *Torah* to Moses on the 6th, the *Zabūr* to David on the 12th, the *Injīl* to Jesus on the 18th, and the *Furqān* to Muhammad on the 24th. That the Qur'ān was sent down in the month of Ramadān seems to be the teaching of that book itself (II, 185/181) though no mention is made of any particular day. If the *Furqān* mentioned in VIII, 41/42 means the Qur'ān, it was sent down 'on the day that the two parties met', i.e., presumably on the day of the Battle of Badr, so that the reference may be to the 17th Ramadān. As to the other books there is no statement in the Qur'ān about the time of their being sent down. The Jews, he says, claim that the Torah was revealed on the 6th of Siwan (see *Targum Sheni* to Esther, iii, 8), but there is no means of deciding whether at that time Siwan corresponded to Ramadān. As to the Gospel, he comments laconically that the statement that it was revealed on a certain set day can only be the statement of a man who has never read the book and knows nothing of its composition and arrangement. What the truth may be as to the Psalms of David and the *Suhuf* of Abraham no one knows nor can anyone find out, so that God alone knows the truth of the matter.

It is quite clear from this that al-Bīrūnī does not subscribe to the popular view that the copies of the Old and New Testaments in the hands of the Jews and the Christians are not copies of the books originally revealed to those communities. He knows these books from personal contact. He knows that the Torah and the Prophets were written in Hebrew (*India*, 18), and that the language of the New Testament is Syriac. It seems likely that he himself knew the Old Testament in Syriac also. He has read these books, and quotes from them. He knows also that the Hindus, Manichaeans, Samaritans, Sābians and Zoroastrians have sacred Scriptures, and even that some of the Christian sects have Gospels of their own (*Chron.*, 207). He does not expressly state his own view, but his practical

attitude is to regard these Scriptures as the genuine Scriptures of the various faiths, which may be used as authentic documentary evidence for their beliefs and religious practices

(*d*) *Cosmologies*

The various groups which had Scriptures that in their eyes contained divine revelation, were all, he found, much interested in the beginnings of things, and had their own stories of the creation of the world and of man, and their own calculations as to when the world as we know it would come to an end That is, they had their cosmologies and their eschatology He himself is sceptical about all these creation stories (*Chron* , 13, 14, 112) Creation was a long time ago, and in the case of even the earliest of these stories it is an account of a very remote age regarding which they can have no attestation, but only tales and traditions which have been handed down by memory and mixed with all sorts of falsifications in the process of transmission For this reason they cannot be regarded as historical accounts, but belong to the realm of myth As to the duration of the world they have various ideas The Zoroastrians taught that the world would last for 12,000 years (*Chron* 14), the Buddhists that it will last a million years (*Chron* , 206), while other groups believe in a cyclic series, a new world coming into being as soon as one cycle ends with the perishing of all beings, and then there is a new creation for the beginning of the new cycle (*Chron* , 112) Each new cycle will then have its Adam and Eve, or indeed a number of Adams and Eves if we wish to account for the different races and languages In this connection he tells on the authority of the book of Sa'īd b Muhammad adh-Dhuhlī the story of the Iranian first human pair and their earthly Paradise

(*e*) *Demons*

A description of the perfume and incense rites used among the Khwarizmians at certain specified times to keep off malign influences and injuries from demons and evil spirits leads him to notice theories as to the origin of such demonic spirits (*Chron* 237) The Qur'ān leaves no doubt as to the existence of the Jinn and their contacts with human kind The most famous philosophers also he asserts, believed in them Aristotle calls them 'human beings and describes them as beings of air and fire Johannes Grammaticus, the Egyptian Jacobite whose learning was appreciated by the Muslim conqueror of Egypt, 'Amr b al-'Āṣ (Barhebraeus, *Mukhtasar* 175 176), he says, described them as the impure parts of erring souls which, owing to their error and failure to find the truth were unable, when they separated from the body, to find their way back to their primal origin, and so wander in confusion. He knows of similar

views of Mani detailed in the Manichaean books, though the statements he found there are so obscure that he does not venture to set them forth It is not impossible, he thinks, that some such precautions as those taken by the Khwarizmians may be effective against these spirits There are, he knows, some who sneer, deride and make mock of such precautionary measures, but sneering is not argument On the other hand some most distinguished savants, Galen, for example, having witnessed the effects of charms, incantations and prayers used as prophylactic measures against malignant influences from evil spirits have acknowledged their efficacy He himself favours their use, especially if used in connection with astronomical influences

(f) Qibla

Every Muslim in performing his ritual prayers takes his stand facing the Ka'ba at Mecca This raises an interesting point in Comparative Religion, that of orientation for prayer To the Muslim the Ka'ba is the *qibla*, or prayer direction In the earliest years of Islam the *qibla* was Jerusalem In mentioning the date in mid Sha bān on which Muhammad suddenly changed the prayer direction from Jerusalem to Mecca, and caused so much discussion in his community, and so much controversy with his adversaries, he takes occasion to discuss this question of prayer direction The Harranians, he says, always turn to the South in prayer, for the south pole is their *qibla* The Sābians, on the contrary, face North their *qibla* being the north pole The Manichaeans also he has heard, face the north pole since that in their belief is the highest point in the universe, the mid-point of the dome of heaven (*Chron* 331) The Christians however, always turn towards the East, the rising place of the sun, and orient their Churches thus (*Chron*, 249) He quotes with approval, however, from a book by one of the Manichaean missionaries, which reproaches people of the various religions for thinking that it is important to turn in one direction rather than another seeming to indicate by this the very proper notion that a man who genuinely prays to God does not need any *qibla* at all

(g) Burial Customs

All over the area with which al-Bīrūnī was in contact funerary ceremonies were regarded as of the utmost importance, and indeed, if we may generalize from the results of some of the most recent excavations, had always been regarded in those areas as of the utmost importance It is thus not strange to find him in Chap LXXIII of his *India* dealing with this whole question of death and the disposal of the dead In his view the most primitive custom

was exposure, the bodies of the dead being simply thrown out to be disposed of by the elements The first improvement on this was introduced by a legislator who bade the people limit the exposure by making it an exposure to *wind* alone This they did by constructing roofed-in buildings in which the dead were laid, the walls of these buildings being so constructed that the winds could pass freely through and attend to the disposal of the bodies The Zoroastrian *dakhmas*, he thinks, are a modification of this custom The next improvement was to expose them to *fire*, which in a more sanitary fashion would dispose of all This method was introduced into India by Nārāyana, but was a method practised also by the ancient Slavs and the ancient Greeks In classical Greek times the bodies were buried, so as to be disposed of by *earth* Among the Buddhists the bodies were thrown into rivers to be disposed of by *water*, and the Hindus after the burning will scatter the ashes over running water

(*h*) *Hall-marks*

A small but important point of general theory of religion is that he has seen clearly how there is usually some characteristic feature that will serve as a Hall mark of a religion (*India*, 24) For the Muslims, he says, this is their *kalima* 'there is no god but Allah, and Muhammad is his Apostle', which they repeat in season and out of season For the Christians it is the Trinity, and for the Jews the Sabbath Both of these are rather surprising to us, for we should have thought that he would have recognized that the great point of distinction between the Melkites, Jacobites and Nestorians, with all of whom he had considerable acquaintance, was their interpretation of the doctrine of the Person of Christ, while we should have expected him to note as the Jewish Hall-mark their reverence for the Law It is possible that his word Trinity is meant to suggest this exaltation of the person of Christ, and his word Sabbath may be meant to stand for reverence for the Law It is more likely, however, that he is here being influenced by the Qur'ānic references to these religions The Hall-mark of Hinduism, he says, is its doctrine of transmigration We should probably have used the word *karma*

THE RELIGIONS

A detailed exposition and criticism of all al Birūni has to say on each of the religions he mentions in his works would take up far more space than we have at our disposal On most of these religions we now have in our hands much better sources than were available to him in his day, so that we can supplement and correct his information on many matters Nevertheless we can in brief

indicate the contribution he was making to the study of these religions in his own day

HINDUISM

Sachau, in the Introduction to his translation of the *India* has given an account of the sources which al-Bīrūnī quotes in his account of the Hindu doctrines and practices That we cannot today identify all of these quotations in the printed texts may be due to two reasons Firstly, we cannot always be sure that the recension of a Sanskrit work which we now use in printed texts, e g the text of the *Gita*, is the same recension which was available to him in his day Secondly, we are never sure how much the text of al-Bīrūnī's work has suffered in the process of transmission The same holds true to some extent in connection with his quotations from Greek writers There is also the possibility that in some cases he himself did not see the actual text of the work he quotes, but is depending on what was told him, or what he found in some work of one or other of his predecessors in this field A summary of his account of the religion of the Hindus was published in Vol IX of A V W Jackson's *History of India* in 1907 (pp 154–199), to which reference may be made

Al-Bīrūnī is always conscious of the fact that there is a great difference between the religion of the masses and that of the educated Brahmans, and that this difference extends into even fundamental religious conceptions (*India*, 13) Educated Hindus, e g abhor all anthropomorphism of the Father and Son variety, whereas the popular religion is full of such (*India*, 19), and even indulges in rather crude descriptions of the family relationships of the deities The religion of the educated, he found, had a strong tendency towards monism, whereas the popular religion is frankly pluralistic and polytheistic (p 19) The masses pay great reverence to the images of the gods, which images are to them idols receiving idolatrous worship, whereas the educated follow *sāra*, which is an imageless worship of God (p 54) The ignorant people are of the opinion that the joys of Paradise and the pains of Hell are for the body, whereas the learned know that they affect only the soul (p 31) So great is the gap between the two that in the interests of harmony their learned men have had to make concessions to the popular theology against what they know to be the truth (*India*, 225, 226)

In his opinion the teachings of the Brahmans represent the real religion of India, so that he bases his exposition on what he could discover about what they believed and thought (p 19) He found them, however, not much inclined to theological discussion (p. 10), quite unlike the Muslims Moreover, they were not co-operative with an enquirer however earnest and sincere he might be He found them so convinced of their own superiority over all other

peoples that not only will they not intermarry with them, or sit to eat and drink with them, but call them impure, and think that they themselves are defiled if they come into contact with them (p 10) So great is their pride, indeed, that they will never confess their ignorance, being unwilling under any circumstances to say 'I do not know' (p 84) Yet by some inner perversity of their nature, they seemed to a Muslim to be always insisting on putting things the wrong way around (p 90) However, he had been able to procure some of their books, and though he knows that there are differences of opinion among their learned men, he thinks he may venture to put forth what he has learned of their system

(*a*) *God*

To them God is the absolute, and as such is a unity He is the only real existence, and so the source of all other existences, everything that exists coming into existence through him He is self-sufficing and beneficent, the One who gives without receiving. He is without beginning and without end, the ultimate cause, sublime beyond likeness or unlikeness, and so is unattainable by thought (pp 13–15, 38) The Hindus are monists in the sense that they hold that all is of God, e g it says in the *Gita* that Vishnu made himself earth, made himself water, made himself wind and fire With this he compares a passage in the *De Causis Rerum* of Apollonius, which finds a unity in creation because there is the divine in it all, and he suggests that the Persian use of the word *Khudā* for 'Lord' may be meant to shadow forth the same idea With the notion of God as universal cause (p 14) he compares the teachings of the Greeks and of the Sūfī mystics on the First Cause (pp 15, 16).

It is somewhat curious that his knowledge is mostly of Vaisnavism Vishnu (= Nārāyana) is without beginning and without end (p 105), and yet he is said to have appeared in this world at different times and under different names (pp 198, 190) To represent such appearances they have images of the god, and though the *Gita* explains clearly that God is not to be confounded with these idols (p 59), the idols are dear to the populace, and the priests, who find it to their interest to keep the masses in thraldom, not only encourage reverence of idols, but resort to all sorts of tricks and frauds in connection therewith (p 59) From the *Samhitā* of Varāhamihira he quotes the rules laid down for the making of idols (pp 56–58), and tells of the servants and priests dedicated to minister to these idols (pp 58, 59) Some of the more famous idols known to him he mentions expressly (pp 56, 252)

(*b*) ***Angels and Spirits.***

Lower than the gods but higher than men are the angels and spirits, who live in a very tenuous and subtle kind of matter They

eat and drink, cohabit, live and die, but by reason of their nature can do a great many things that are impossible to human kind They are of various kinds The *Daevas* or angels belong to the north, to the heavenly places and Mount Meru (pp 44, 118, 121) They are ever inclined to worship and never disobey a divine command (p 147) Then there are the *Pitaras* and *Rishis*, who are human ancestors There are the *Yaksha* or guardian spirits, the *Rākshasa* and other kinds of demons who live in the south, the *Nāga* or serpent spirits, demon sorcerers and other lesser types of demon spirits (p 44) The angels were involved in the process of creation of the universe (p 164), with which he compares Plato's teaching about the θεοι, who under command of their father carried out the work of creation Man may have some sort of intercourse with these beings by making them the object of his meditation (p 37)

(*c*) *Cosmology*

The universe was not created out of nothing There was a primordial stuff, which some call 'darkness', others 'time', and others 'nature' (p 164), which was put into motion Then water, rolling and foaming, filled all space, till out of it came the primal Egg which, when it split, gave one half to form the seven heavens and the other to form the seven earths (p 109) This primal water he compares with the Qur'ānic statement (XI, 7/9) that in the beginning Allah's throne was on the waters, and the egg theory he compares with Greek parallels The earth is held in place by the water, the water by the fire, the fire by the wind, the wind by the heaven, and the heaven by its Lord (pp 112–114) Underneath the lowest earth is the great coiled serpent with the thousand heads (p 118), and in the very midst of the earth directly under the north pole star is the World Mountain Mount Meru (p 121ff), the mountain knot of the mountain systems of the world This Mt Meru, he is aware, is also known to the Buddhists, and with the legends concerning it he compares the Muslim legends about Mt Qāf, and the Zoroastrian legends about Ārdiyā (pp 124, 125) The rivers flow down from the mountain knots the holiest of them being the Ganges (p 133), which used formerly to flow in Paradise with the Milky Way as its bed, but was brought down to earth

Over the earth the seven heavens are spread out like seven canopies In them are set the sun, moon, planets, and stars, the wonder of whose workings has made the study of astronomy and astrology of great repute among the Hindus (pp 73, 74) Among the stars are luminous bodies which are not really stars, but are righteous men who have been given their eternal reward and been set on thrones of crystal in the heavens (p 232) Various ceremonial sacrifices are offered at the heliacal rising of certain stars (p 247),

and there are ceremonies connected with eclipses (p 255) The components of the universe are five—(1) *purusha* or soul, (2) *avyakta* or amorphous matter, which has potentiality but not actuality, (3) *vyakta* or formed matter, the union of *avyakta* and *vyakta* giving *prakriti*, (4) *ahankāra* or nature, and (5) *mahābhūta*, the five elements—heaven, wind, fire, water, earth (pp 19, 20) The created universe will end, of course, in the great conflagration (p 165)

(*d*) *Man*

It is difficult to give his account of the Hindu doctrine of man without quoting in extenso whole pages of his treatment In brief man is *purusha*, or soul, and so belongs to God, but he is involved in matter What binds him to matter is ignorance, so his redemption from matter will be by knowledge (pp 19–22, 33, 34), a doctrine which invites comparison with the teaching of Socrates on the liberation of the soul by knowledge (p 35) In one human lifetime, however, man learns relatively little, so obviously he must be given rebirth into the world so that he may learn a little more This is the famous Hindu doctrine of metempsychosis (pp 22–29) The goal of liberation is the union of the soul with God (pp 39, 40) but this liberation (*moksha*, p 34) can only come after a whole series of reincarnations Of course a man in any one incarnation may not attain to any knowledge, but become only the more deeply entangled in ignorance Thus there is a moral purpose governing reincarnation, each new incarnation depending on the merit and attainment of the previous life, retribution being calculated according to intention rather than to deed (p 31) Four worlds are involved in this process of metempsychosis, our normal world which is called *madhyaloka*, an upper world or Paradise called *svarloka*, a lower world or Hell, called *nāgaloka*, in which two worlds the soul receives reward for its good deeds and punishment for its bad deeds for some time before it is ready for its reincarnation, and also *tiryagloka*, or the irrational world of animals and plants, to which go souls which have not deserved the height of heaven nor the depth of hell A great number of different hells are pictured as fitted for the expiation of various kinds of evil (pp 29, 30) These hells may be avoided by works of repentance and expiation (p 32), and since abstinence from evil is a sure way of increasing knowledge, the way of virtuous behaviour is thus a high-way to liberation (pp 35–37)

This discussion naturally calls to his mind similar views on metempsychosis among the Greeks and the Sūfīs, whose parallel doctrines he sets forth (pp 28, 29, 32, 37, 40–43) It also suggests the views on this matter he has found in earlier Muslim writers It is interesting to note here that he quotes Vyāsa's idea that if men could only learn properly the elements it would not matter very

much what religion they followed, for the final end of salvation would in every case be the same (p 22)

(e) Scripture

God has not left man to grope alone in order to find his way to *moksha*, but has revealed truth to man through Scripture The *Veda* he regards as having been 'sent down' as the Qur'ān is said to be (p 14) It is the supreme book of Scripture to the Hindu It is in metric form, and was formerly never written down but was cantillated and so handed down orally, in which process of transmission certain parts have been lost (pp 60–62) At present there are four *Vedas*, which, being divine, are inimitable The Brahmans recite the *Vedas*, but often, he found, they did not understand much, though these books contain the rules for daily life, what they must do and must not do, and the rules for the conduct of their worship It may be recited to Kshatriyas, they told him, though they are not allowed to teach it, while Vaiśyas and Śūdras may not even hear it (p 60) Those who hold the cyclic theory speak of the *Veda* being renewed at the beginning of each cycle (pp 73, 190, 197) The *Purānas* are of human origin having been composed by the *Rishis* (p 63) The twenty *Smriti* books are derived from the *Vedas* Besides these they have other books on rules for ascetic practice, theosophy, jurisprudence, astronomy, divination, etc (p 63–75) which are connected with religion Peculiar among these is the *Mahābhārata* which they highly revere and consider as containing a summary of everything found in the other religious books (pp 64 65) Al-Bīrūnī knows the mystic doctrine of the great word OM, which he compares with the mysticism of the Tetragrammaton (p 82)

(f) Society

In his world man is necessarily organized in society Hindu society is rigorously stratified State and Church are inseparably united for the higher development of human society To keep society orderly it has been arranged, as in other countries, into groups according to the various necessary functions that have to be performed for the welfare of society Yet whereas the Muslim considers all as equal before Allah in all things save piety, the Hindus have organized their groups into castes of descending scale of value—Brahmans, Kshatriyas, Vaiśyas, Śūdras and outcastes, considering these as divinely ordained, and making it a sin for any man to wish to break from his caste (pp 48–50)

Like the Greeks they consider the laws that govern their life in society as having come down to them from the *Rishis*, and so to have more than merely human sanction (pp 51, 52) The Brahman's

life is the one most hedged about by law, for he is the most important member of society All his life is plotted out for him from his seventh year to his death (pp 267–270), though there are assigned duties for other castes (pp 270, 271) The Brahman is the man of religion in the system, and every act of his life has religious significance for the well-being of the group

(*g*) *Cult*

The Brahmans are the priests in both the public and the domestic cult services (p 268) Their prayer consists of praise, glorification and adoration, the sun being their *qibla* (p 269) Sacrifices have been practised since Vedic times and are both public and private, e g at weddings (p 271 ff) Dietary regulations are strict (pp 270, 276, 277), and there are periodic fasts (pp 284, 285) The religious festivals and festive days he found were mostly celebrated by women and children (p 287 ff), but pilgrimages, though not obligatory, were much in favour (p 273), especially those to holy waters, to Benares, and to certain shrines (pp 274, 275) There was also a worship of fire with flower offerings (p 268) Almsgiving he found to be obligatory as a religious duty (p 276) He mentions their view of the sanctity and inviolability of the marriage bond, and the custom of widow-burning (p 278), and also their peculiar funerary rites (pp 282 ff) It is rather curious that he makes a comparison between Hindu and Christian ethics (p 280)

Buddhism

It is curious how little al Bīrūnī has to say about Buddhism He knows the name Buddha but he usually calls the Buddhists *Shamaniyya* (*India*, 10), which reminds one of the Greek names *Σαρμαναι, Σαρμανες, Σαρμαναιοι* and the Latin *Samanei*, which represent the Sanskrit *śramana* or the Pali *samana* Before the days of Zoroaster, he says, all Khurāsān, Persia and 'Irāq as far as Mosul was Buddhist (*India*, 10), but now-a-days it is to be found as the religion of the people in certain parts of India China, and among the Turki tribes (*Chron* , 206) It may be conjectured that Buddhism had for the most part died out in those regions with which al-Bīrūnī was personally acquainted so that his knowledge of this religion was mostly at second hand He knows the hatred of the Buddhists for the Brahmans (*India*, 10) They were idolators, many of whose idols and monuments were still to be seen (*Chron* , 206) Like the Hindus they believe in the migration of souls, (*Chron* , 206), and that our present world will end up in a great conflagration (*India*, 166), though as to the actual duration of the world they differ, some saying that it will endure a million years, others that it goes on to eternity (*Chron* , 206) He knows that the

Buddha was sent as a prophet to India (*Chron*, 207), and of the teaching about the *buddha, dharma* and *sangha*, (*India*, 20), of which, however, he has no proper understanding, and he thinks that it was the Buddha who ordered them to dispose of dead bodies by casting them into the water (*India*, 284) That he twice calls the Buddha by the name Buddhodana may be due to a textual corruption He seems to know that there were Buddhist Scriptures, for he mentions a work on 'knowledge of the Unknown' composed by the Buddha (*India* 75), but apparently he had no contact with the Scriptures known to us Nor were there any Buddhist texts among the Indian works to which he refers, save one grammatical and one astronomical text (*India*, 65, 75) Of their sects he mentions only the red-robed, but would seem to think that this was a word that could be used to cover all Buddhists (*India*, 65, 75)

ZOROASTRIANISM

Sachau is probably right in thinking that in the country districts of Persia the majority of the people in al-Bīrūnī's day were still Zoroastrians There may also have been considerable communities of them in the bigger towns, for we now know that the progress of Islam among the people was but slow even though the land was under Muslim domination It would thus have been no problem for him to have come into contact with living and practising Zoroastrians from whom he could have learned necessary details about their faith and practice He may even have used documentary sources, for much more of their literature seems to have been available in his time than has survived to us

We have already noticed his curious idea that Zoroastrianism succeeded Buddhism in Iranian lands (*India*, 10) He knows, however, that there was a Magian religion before Zoroaster, though no pure form of this was any longer in existence (*Chron*, 318) The early Iranian religion he says, was in pre-Zoroastrian times a worship of sun, moon, planets, and the primal elements (*Chron*, 204) He gives the well-known story of how Zoroaster came forth as a Prophet in Azarbaijan, preached in Bactria, and after the conversion of King Gushtasp was able to spread his religion and set up his fire-temples from the frontiers of China to those of the Greek Empire (*India*, 10) He knows how later it became the State religion in Persia (*India*, 11), was introduced into Soghdiana (*Chron*, 234), and later into India where there were communities of Zoroastrians in al-Bīrūnī's own day (*India*, 11)

That they shared with other peoples the idea of a World Mountain (*India*, 125), and exposed their dead on towers of silence (*India*, 283), we have already noticed They had also their teaching about origins, and he reproduces two versions he had heard of the

story of the struggle between Ahriman and that curious creature Gayōmarth, who was born from the sweat of God, from which struggle came the creation of the first human pair (*Chron*, 99, 100) He tells also the story of Frēdūn's subduing and binding the great demon Dahhāk (*Chron*, 223) Their priests, who have great authority among them, are the Mobadhs and the Hērbadhs (*Chron*, 100). He says little, however, about their religious customs save that they do not fast (*Chron*, 230), and that they have a marriage custom somewhat like the Jewish Levirate (*India*, 53) Their Scripture is the Avesta, which they recite in a curious whispering fashion (*Chron*, 219) A great part of their religious code, however, and most of their monuments, were destroyed by Alexander the Great (*Chron*, 129) He gives a long account of their calendar of festivals, in which he collects a good deal of miscellaneous information as to their religion (*Chron*, 215–233) Of more interest to us is the fact that he gives us some account of the curious heretics who arose on Zoroastrian soil He says that there were no schisms among them till the time of the coming of Jesus (*Chron*, 207) What the early schisms were which arose then, he does not tell us but he gives quite a number of details as to the teachings of Mazdak, Bahāfirīd and Ibn Abī Zakariyyā (*Chron*, 209–214)

MANICHAISM

The interest of al-Bīrūnī's account of Manichaism is that the Manichaean Scriptures and books by Mani's disciples were still extant in his day, and he could quote from them Many scattered communities of Manichees were still in existence then, with whom he could have had personal contact (*Chron*, 209) He also knew the works of others who had written about this religion He praises highly the account that al-Iranshahrī had given of Manichaism (*India*, 4), and quotes two Christian writers from whom he had drawn information about them (*Chron*, 208) It is interesting to see that he places Mani in the Christian succession, in the line of Marcion and Bardaisan (*Chron*, 207) for this is the tradition found almost everywhere in the Syriac writers In *India*, 19 he emphasizes the close relationship in which they stand to the Christians He calls Mani a pupil of Fadarūn (*Chron*, 207), a name which is most probably a corruption of *Κερδων*, the well known name of the teacher of Marcion Mani, however, was not a Christian, he was an eclectic who, having studied the doctrines of the Magians the dualists and the Christians, set up as a Prophet himself, claiming that as Buddha had been sent to India, Zoroaster to Persia, Jesus to the West, so he in this age had been in similar fashion sent to his generation (*Chron* 207) His doctrine of metempsychosis he got from the Hindus (*India*, 27), from whom also he derived his explanation of

the ebb and flow of the tides (*India*, 253). From the Christians he got the idea that he must have a Gospel (*Chron*, 23) Either Buddhist or Hindu is his teaching about the cyclic series (*India*, 191), and doubtless of the same origin is his prohibition of killing for food (*India*, 276), while from the Judaeo-Christian tradition came his notion that in heaven there is neither male nor female in our earthly sense (*India*, 19) His conception of himself as the Paraclete is obviously of Christian origin (*Chron*, 208)

Of Mani's books he knows the *Shāhpūrqān*, which the teacher had composed in Persian for Shāpūr I, and from which he quotes twice (*Chron*, 118, 207), his *Gospel*, which differs from that of the Christians, and is arranged under the twenty-two letters of the alphabet (*Chron*, 207, 208), his *Thesaurus* (*Chron*, 208), from which he also gives a quotation (*India*, 19), his *Book of Giants*, *Book of Books*, and many treatises (*Chron*, 208), and his *Book of Mysteries*, from which he also quotes (*India*, 27) This shows a quite remarkable acquaintance with the Manichaean Canon It was from the *Shāhpūrqān* that he extracted Mani's account of his call to preach (*Chron*, 118, 207), and because of the superior reliability of this book he uses it as the source for one of his calendar calculations (*Chron*, 121) It was this book, he says, that they used as a Code for the guidance of their daily life (*Chron* 118) Like Augustine he was impressed by the Manichaean use of pictures in their books and in their places of worship (*India* 53), and perhaps there is a reference to their books where he speaks of how the Manichee propagandists present Mani's biography to the people in a beautiful and attractive garb (*India*, 132) One work of a Manichaean missionary he knows and quotes, viz the *Book of Marriage*, which repudiated the need for a *qibla* (*Chron*, 331)

His account of Mani's life and death follows the usual tradition we know from Christian and Muslim books (*Chron*, 208), so that he is doubtless reproducing the commonly accepted account of his day He knows how the Manichaean community is divided into Electi and Auditores (*Chron*, 207, 208), and indeed describes the peculiarly ascetic life prescribed for the Electi as the religious leaders responsible for the propagation of the faith, whereas the Auditores have as their main duty the support of the Electi (*ibid*) As to Mani's teaching, he mentions in particular his dualism (*Chron*, 207, *India*, 59 132), his doctrine of the Primal Man (*Chron*, 207), of *ahimsā* (*Chron*, 207), of the presence of soul in all matter (*India*, 23) He quotes Mani's denial that they worshipped sun and moon (*India*, 284), and his view, which al-Bīrūnī found obscurely expressed, as to the state of souls which had failed to come to a knowledge of the truth (*Chron*, 237) In his day there were some of the Manichaeans who were ascribing all sorts of miracles and wonders to Mani, while others denied that he was a miracle worker (*Chron*, 209)

The Manichaean communities in the Muslim areas, save at Samarquand, seem to have been but scattered communities, but he says that most of the eastern Turks in his day were Manichees, and that there were considerable communities of them in China and Tibet, and not a few in India (*Chron*, 209) He is fully aware that the Muslim community had suffered from their religious propaganda, mentioning especially the work of Ibn Maqaffa' (*India*, 76), Ma'n b Zā'ida and his uncle 'Abd al-Karīm b Abī'l-'Awjā' (*Chron*, 67, 68, *India*, 132) and their fellow *zindīqs*, who were preaching the doctrines of Mani pretending that this was the true Islam, This is quite of a piece with what we read in the Chinese writers of the Manichaeans in China pretending that their doctrine was the real Buddhism, and Augustine's complaint that in the West they tried to make out that they were really Christians but with a special message

Greek Religion

His knowledge of Greek religion is quite obviously derived from books and often at second-hand He knows of the Seven Sages (*India*, 15), of Plato and Socrates (*India* 12, 21 28, 32, 51, 59, 282), Homer (*India*, 21, *Chron*, 86), Aristotle (*Chron*, 182, 225, 237, *India*, 60), Aratos (*India*, 47), Ptolemy (*Chron*, 29), Proclus (*India*, 28), Galen (*India*, 59, *Chron*, 237, 243, 297), Hippocrates (*Chron*, 266, etc), Eudoxus and Dositheus (*Chron*, 244), and others, for the most part those authors more usually known in the Muslim world He consults them as a rule for information on matters concerned with his scientific interests so that his references to Greek religion are merely incidental, and for the most part simply in comparison with Hindu ideas, since he holds that the pre Christian Greeks held much the same views as the Hindus (*India*, 12) Thus he brings in their views for comparison with the doctrine of the First Cause, on the pre-existence of souls, on the deification of humans in consideration of their superhuman powers on plants having a kind of animal sense, on metempsychosis, and on the cyclic series (*India*, 15-17, 21 28, 192) Early Greek religion, he says, was idolatrous and anthropomorphic (*India*, 18 46, 50, 60) He thinks that the language they use of Zeus is very similar to that which the Brahmans use of Brahma (*India*, 47), and he quotes the Stoic view that Zeus really means spirit diffused in matter (*ibid*) As Hindu law was said to come from the Rishis, so he says Greek religious and civil law was derived from such sages as Solon, Draco, Pythagoras, Minos, who received divine assistance in drawing up their codes, and he quotes Plato as saying that the Athenians claimed that their laws were from Zeus, while the Lacedaemonians held that theirs came from Apollo (*India*, 51, 52) On the problem of the origins of all things, he quotes Ibn Zakariyā ar-Rāzī as stating that the Greeks

taught that five things had lasted from all eternity, viz the Creator, the universal Soul, primal matter, space and time (*India*, 163) There were rationalists, however, among the Greeks, who did not follow the popular leaders where these claimed to base their knowledge on a supposed divine inspiration (*Chron* , 51)

JUDAISM

Though al-Bīrūnī mentions his contact with Jewish teachers (*Chron* , 187, 276), it is a little difficult to estimate how much of his knowledge of Judaism is at first hand He seems to have had access to the text of the Old Testament, and has quotations from Genesis, Exodus, Leviticus, Deuteronomy, Job, Psalms, Daniel, Chronicles, Isaiah and Zachariah, though at times it looks as though he is quoting from the Peshitta rather than from the Hebrew text Yet he knows that the Torah was in Hebrew (*India*, 18), and that there was a Greek translation of it in use among the Christians, whose correctness the Jews disputed and the Christians defended (*Chron* , 20, 21, 279) He seems also to have been acquainted with the Book *Seder Olam* (*Chron* , 74) He knows that the MSS of the Torah were generally written on the skins of gazelles (*India*, 81), but in *India* 53 he says that they were accustomed to use pictures in their books and places of worship This, however, may be merely a slip, for the Christians and Manichees whom he mentions in the same sentence were noted for their use of picture illustrations His statement that the Torah itself refutes Jewish tales that God drowned Pharaoh (*Chron* , 330) would seem to point to first-hand knowledge of the text, as perhaps would also what he says about the Tetragrammaton (*India*, 82), and his reference to what it says about there having been giants in olden time (*Chron* , 83, 84)

The nations round about Palestine were idol worshippers, and he knows the story of how the Israelites who rebelled always went after Baal and Ashtoreth (*India*, 18), and how the people fell into idolatry after the split in the nation at the death of Solomon (*Chron* , 74) He is aware of the importance of Jerusalem as their central seat (*Chron* 146), and the importance to them of the Sabbath institution (*India*, 24, *Chron* , 275), and the Passover (*Chron* , 56) In discussing the marriage customs of the various nations he includes a reference to the Levirate marriage (*India*, 53) Of more than usual interest to us is his mention of their expectation of a Messiah and the use made of this expectation by numerous false prophets who at various times arose among them (*Chron* , 15, 16) It is somewhat curious to find him referring to Muslim use of the wisdom of Daniel, a wisdom which they said was derived from the book *Cave of Treasures*, in which Adam had set down the wisdom he had learned (*Chron* , 302) His main interest is naturally in the Jewish

calendar, so we find him discussing the various cycles they knew, such as the Jubilee and the *Shabū'* (*Chron*, 176, 177) and the *Tequfōth* (*Chron*, 182) and giving details as to their festivals—New Year, Yom Kippur, Tabernacles, Hanukka, Purim, Passover, etc (*Chron*, 275–281) Occasionally he mentions the Jewish sects known in his day, the Rabbanites, Miladites, Qaraites, Maghribis, Alfaniyya (*Chron*, 57, 58, 284)

SAMARITANS

It is perhaps a little surprising that he should have known anything about the Samaritans, even though they were a much more numerous community in his day than they are in ours His information about them, however, seems to have come from secondary sources He knows that they originated from a mixture of the indigenous people of that area, who had aided Nebuchadrezzar against the Jews, with those people whom he sent from Babylon to replace the Jews he took away into captivity (*Chron*, 21, 318) He knows their 'churches' at Nablus, and is aware of the enmity between them and the Jews, which led them deliberately to deceive the Jews (*Chron*, 57) They have never entered Jerusalem, he says, since David transferred the temple from their Gerizim site to Jerusalem (*Chron*, 21) He quotes Abū 'Īsā al-Warrāq as authority that the Samaritans do not celebrate the Feast of Tabernacles (*Chron*, 277) His suggestion that their religion consists of a mixture of Magian and Jewish elements (*Chron*, 21, 318), is apparently a wrong inference, though he is right on the question of their recognizing no Prophet since Moses (*Chron*, 21) The most interesting thing is that he knows that they have a Torah whose year reckonings differ both from those of the Jewish copy and those in the Christian Greek translation (*Chron*, 21) His statement that they call their Torah by the name *al-Lāmasūsiyya* (i e the touch not), is apparently based on nothing more than the Qur'anic verse XX 97, which has been the source of so many curious Muslim notions about the Samaritans Both this and his statement that they do not allow other people to touch them just as they themselves do not touch others, is merely an exaggeration of the well-known Samaritan insistence on ritual purifications

CHRISTIANITY

There were Christian communities, often very considerable communities, in all the areas with which we know al-Bīrūnī to have been in personal contact He seems to have known all three of the Christian groups of the Orient, the Melkites, the Jacobites and the Nestorians (*Chron*, 288, 315), though his information about the Jacobites is much less copious than about the others, and indeed, he in one place remarks that he has never met a Jacobite nor one

who knew their dogmas (*Chron*, 315) Not infrequently he mentions Christian authors and books, and even Christian scholars with whom he was in friendly intercourse Christianity, he says, had been very generally adopted in the empire after the death of Diocletian In his days the Melkites were mainly in the areas nearest to Greece proper, though there were scattered communities of them elsewhere, even in Khwarizm (*Chron*, 288), and have their Catholicos for the Arab countries at Baghdad (*Chron*, 289) The Nestorians, he says, made up the majority of the inhabitants of Syria, 'Irāq and Khorāsān, whereas the Jacobites were mainly in Egypt and the countries adjacent thereto (*Chron*, 288) The four great Patriarchates in his day were those of Constantinople, Rome, Alexandria and Antioch, the Catholicos at Baghdad being under the throne of Antioch (*Chron*, 289) He notes that the Nestorians at that time nominated their Catholicos but his actual appointment was at the hands of the Caliph, since their lands were entirely under the domination of Islam (*ibid*) He knows that the chief dogmatic difference between these groups was their interpretation of the union of the two natures in Christ, and that it was over this point that there had arisen the Arians, whose views in this matter were nearer those of the Muslims (*Chron*, 288) Their Churches were familiar to him He comments on their orientation (*Chron*, 249), and on their use of pictures (*India*, 53) There were Arab Christians in his day, who had their own peculiar fast days connected with their own local history (*Chron*, 314), a very interesting piece of evidence of how quickly Christianity became indigenous in these Oriental lands Though there was enmity between the Christians and the Jews, which caused the Jews to delight to deceive them by lies (*Chron*, 304), he finds that for their fasts and their festivals they agreed on the whole with the Jewish computations the cardinal point being the date of the Passover (*Chron*, 11)

We have already noticed his acquaintance with the Septuagint as the Christian version of the Torah (*Chron*, 20, 21) He knows the Gospels in Syriac (*India*, 18) He quotes a conflate text of Matthew and Luke in *India*, 3, and quotes both John and Matthew in *India*, 18 That he was acquainted with the four Gospels from personal observation appears also from a number of references, such as to Joseph of Arimathea (*Chron*, 292), to the Gospel statement of the number of days Jonah remained in the belly of the fish (*Chron*, 333) to the transfiguration story (*Chron*, 300), to Herod's killing the infants at Bethlehem (*Chron*, 292), to the descent of the dove at the Baptism (*Chron*, 293), to the annunciation to the prophet Zechariah of the birth of John (*Chron*, 291), and his statement that he found nothing in the Gospels about the tales told of the death of John (*Chron*, 301) He also knows of the differences among the Gospels in their accounts of the Messiah, and how the Christians think to

reconcile these differences (*Chron*, 22) He knows of the seventy-two disciples (*Chron*, 300), and of the Apostleship of Paul, whose eyes the Lord had blinded before He chose him for Apostleship (*Chron*, 288, 299, 314) His statements about Paul's blindness (*Chron*, 314), about the disciples being bidden remain in the Upper Room till the Paraclete come (*Chron*, 308), about the disciples speaking with tongues at Pentecost, and Peter's healing the lame man in Jerusalem (*ibid*), may show a knowledge of the Acts of the Apostles, but may have come to him from other sources He knows that the Christians use the Old Testament to find prophecies there of the coming of Christ (*Chron*, 297) It is interesting to note that he is not only aware that the Gospel is not a revelation sent down all at a sitting, as some Muslims held (*Chron*, 333), but he knows also that it is not a Law code, for the Christian Codes are based on the works of the 'Fathers', who developed them from the sayings of the Messiah and His Apostles (*Chron*, 291)

We have already noticed how he selects the doctrine of the Trinity as the Hall-mark of Christianity (*India*, 24) In another passage he uses this doctrine to provide a comparison with the Hindu teaching as to Brahma being the First Cause, Nārāyana the second force, and Rudra the third force, though in a sense they are a unity as Vishnu, just as the Christian Father, Son and Holy Spirit are three *persons* but one substance (*India*, 46). On the Father-Son designation he has quite a discussion, knowing quite well that in the older religions this did not have the crude sense usually attributed to it in Muslim writings (*India*, 18, 19) Jesus was the 'Son in a very special sense, that special sense in its relation to the Trinity being the point on which the Arians differed from the others (*Chron*, 295, 288), yet in spite of His miraculous birth and constant aid from the Holy Spirit, the Messiah during His earthly life was subject to the ordinary laws of nature (*Chron*, 294 309, 310) His teachings are the ethic of the Christians Al-Bīrūnī knows the Sermon on the Mount, but though he admires the ethic of giving another your cloak and your shirt of turning the other cheek, and blessing and praying for your enemies, he thinks that this is quite unpractical, for mankind are not philosophers, but for the most part ignorant and erring folks who must be kept in the straight path by sword and whips (*India*, 280)

He has a long account of the Calendars of both the Melkites and the Nestorians That of the Melkites has been reproduced with annotations by Louis Cheikho in *al-Machriq* for 1902 and by Robert Griveau in *Patrologia Orientalis* X, 291-312 (1914) In these he gives some details of the way in which they kept the festivals of the Annunciation, Transfiguration, Ascension, Lent, etc, and that of St Helena's Invention of the Cross He knows the differences between a 'commemoration' and a 'feast' (*Chron*, 300), the general

ceremonial for the keeping of a Saint's day (*Chron.*, 288), and that for a 'christening' (*Chron.*, 293). He knows the general scheme of the Christian hierarchy from Patriarch to singers and altar-servants (*Chron.*, 289), and tells how the Patriarchs are elected (*ibid.*) To our surprise he can quote from the *Canones Apostolorum* (*Chron.*, 303), and give quite an account of the first six great Synods of the Church (*Chron.*, 295, 296) On the whole his account is sympathetic, though he blames the Christians of his day for giving too much credence to idle tales without making proper historical investigation (*Chron.*, 292)

There were heretical sects of Christianity in his world In the Introduction to his *India* he promises to quote the views of these when he finds they have something in common with Hindu teachings (*India*, 4), but apparently he did not find much that he could use What is of some interest is that the sects of the Marcionites and Bardesanians were apparently still flourishing, each with its own version of the Gospel (*Chron.*, 23, 201), a fact which makes it easier to understand why Syriac writers were so preoccupied with these two sects Their doctrine, he says, though it was in the Christian succession, was a mixture of Christian and Zoroastrian elements and fundamentally dualistic Bardaisan even claimed that he had the 'Light' of God dwelling in his own heart (*Chron.*, 207)

SĀBIANS

Thrice in the Qur'ān we find mention of the Sābians—II, 62-59 V, 69-73, XXII, 17, as those who, along with the Jews, Christians and Zoroastrians, are in a special way to be counted as Believers in Allah No reference to any such group appears in pre-Islamic Arabia, and our best guess at present is that the Prophet meant by this word to designate some of the Gnostic groups which at that time were fairly active in North Arabia Under the Caliphate various groups claimed the right to be included under this name Al-Bīrūnī is apparently aware that it is a kind of blanket word He knows that it is most commonly used in connection with the Harrānians, though they themselves took this name only under the 'Abbāsids, being really a heathen, idolatrous group deriving from a remnant of the old Greek religion which continued to carry on the old forms of worship when the Greeks in general accepted Christianity Their prophets were Agathodaimon, Hermes, Pythagoras, Wālīs, Mābā, and finally Sawāī who was the maternal grandfather of Plato (*Chron.*, 205, 318) From the list of their feasts and fasts that he gives we gather that they were for the most part worshippers of heavenly bodies, having images of Venus, whom they called Belit, Mars, Saturn, Mercury-Hermes, Sun and Moon, along with Tammuz and Atargatis (*Chron.*, 318-322) Their *qibla* for prayer was the south pole (*Chron.*, 331), and they had books of Hermes,

which he had apparently consulted (*Chron*, 341) This Hermes who played so important a part in their system was identified by some with Idrīs, a prophet mentioned in the Qur'ān who is said to be the Old Testament Enoch, though others said Hermes was that Būdhasāf who was reputed to have come forward as a prophet in India in the first year of Tahmūrath and was the inventor of Persian writing (*Chron*, 204, 206, 216) In *India*, 59, he includes them among those who made much of the idea of a *mystery*

Some said they got their name from their place of abode at Harrān, others, however, said that they were so named from Hārān the brother of Abraham, and al-Bīrūnī quotes from Syncellus the tale about Abraham's connection with them Al-Kindī in his *Apology*, he says, accuses them of being given to human sacrifices He himself thinks that they are monotheists who employ only negative terms in their description of God, and though they have temples and images named after the celestial bodies, offering sacrifices both to the stars and to the images, this did not seem to him inconsistent with their fundamental monotheism (*Chron*, 204–206) They observed certain dietary laws and made much of prayer, having fixed liturgical prayer thrice daily, preceded by purification and accompanied by inclination and prostration, and also voluntary prayers at certain hours (*Chron*, 206) Tradition said that many of the ancient houses of worship whose ruins were still to be seen, such as those at Damascus, Baalbek, Harrān and Selemsīn used formerly to belong to them, and some said even the Ka'ba at Mecca was in former times one of their shrines (*Chron*, 205)

There were those, however, who claimed that the Harrānians were not the true, original Sabians, for these were those remnants of the Jews who stayed behind in Babylon when Cyrus permitted the return There, since they were now isolated, they mingled their original doctrine with some elements of Magianism, and some from the old Babylonian religion, and claimed to be the descendants of Enos son of Seth Others said that Methusaleh had a son named Sābi from whom they got their name These people deny that they are Harrānians, with whose doctrines they do not agree save in some small matters, while in prayer they turn to the North, which is quite the opposite to the *qibla* of the Harrānians (*Chron* 200, 318, 331) Since he places the chief seat of those people in Southern Mesopotamia it would seem that he has in mind the Mandaeans

KHWARIZMIANS

The interest that has been excited in our days in the language and culture of Khwarizm has naturally turned attention to the curious words that al-Bīrūnī inserted so long ago in his account of the festivals of the Khwarizmians We have noticed how he

mourns the fact that at the conquest Qutaiba b Muslim had killed off their priests and learned men and burned their books (*Chron* , 48) In his day, however, they were still maintaining many of their ancient customs Zoroastrianism had not made any great headway amongst them (*Chron* , 235), and apparently Islam spread but slowly in their area They were still following their ancient practice of using perfume and incense rites to keep off the malignant influences of demonic spirits (*Chron* , 237), and on certain days they were accustomed to lay out food in their temples as a banquet for the spirits of the dead (*Chron* , 238) He is able to record six religious festivals which they kept, though he seems to know nothing of them save their names and the dates on which they fell (*Chron* , 237, 238)

ARABIAN PAGANISM

Though al-Bīrūnī, as we have mentioned above, has a strong antipathy to things Arabian, the meagreness of his information about the early Arabian religion cannot be attributed solely to this Muslim orthodoxy had done its best to blot out as far as possible all memory of the old pre-Islamic paganism, and al-Bīrūnī complains of the utter neglect of study of the old ways of life of the pagan past (*Chron* , 141) Partly, he thinks, this was their own fault for these ancient Arabs had been content to remain in illiteracy, depending for the preservation of their traditions on the poems which were memorized, so that when a new religion came in, and no one any longer practised the old rites, the poems connected with them were soon forgotten (*ibid*) Even in his own day the Arabs were an illiterate people who did not read nor write nor reckon (*India*, 242) so that it was useless to turn to them for accurate information

From what has been recorded of them it is clear that they were idolatrous The story was that the idols they worshipped were an importation into Arabia from Syria, and that they paid reverence to them in the belief that they would be intercessors for them (*India*, 59) They were not noted, however, for their respect to their idols, for there was a story, mentioned in certain of the early poets, of how the Banū Hanīta had an idol named Hais, which was made of edible material, and once when the tribe was pressed with hunger they ate their idol (*Chron* , 210) These were the people among whom arose Muhammad's rival in prophethood Maslama, he whom the Muslims always mockingly call the false prophet Musailama, and who, they charge, used to delude the people with cheap tricks (*Chron* , 209, 210) In some forms of their worship the ancient Arabs used hand clapping and whistling with the fingers (*India*, 91), which would seem to point to a Shamanistic form of worship In discussing marriage customs he describes the various types of marriage in vogue among them (*India*, 53), and he knows that they

had no dietary regulations, eating indifferently clean and unclean animals (*India*, 91) The system of intercalation which was characteristic of their calendar they took, he says, from the Jews (*Chron*, 12, 62) He is able to enumerate their main festivals (*Chron*, 325-328), though if these had any religious connections he does not mention the fact

ISLAM

His own religion of Islam he often draws on to provide comparisons and contrasts with things he finds in the other religions he is describing In general he writes as a pious Muslim who accepts the normal orthodox system of Islam At times we find him profoundly contemptuous of some of the arguments much in favour with the orthodox theologians, as for example their deducing mystical wisdom from the fact that the form of the human figure may be considered as resembling the form of the name Muhammad (*Chron*, 297), or their endeavouring to find words of religious significance in the natural markings on rocks or stones (*Chron*, 298) Naturally he is strongly opposed to the attempts of some of the orthodox to prohibit free discussion of religious topics (*India*, 15) On the other hand he at times seems over anxious to assert his orthodoxy, as in his claims for the excellence of the Qur'ān (*India*, 132), or his strange overemphasis on the cogency of the supposed prophecies to be found in the Bible concerning the coming of Muhammad and his position as the final prophet (*Chron* 18-20)

In discussing the question of apotheosis he compares the Muslim use of the name *Allah* with the use in the Jewish and Christian Scriptures of such words as *Elouh* and *Rabb* and how this is related to Hindu, Greek and Manichaean usage of words in connection with deity (*India*, 12-19), which leads him to the very interesting discussion of how these religions use the Father-Son terminology in relation to the divine In discussing the Sunday observance of the Christians he compares the Jewish Sabbath and the Muslim Friday, and the special reasons adduced by each group for observing their particular day (*Chron* 308) He defends the union of Church and State, so characteristic of Islam, as offering the best possibility for the fullest development of human society (*India*, 48) The Muslim Antichrist legend he compares with those of the Jews and Christians, quoting a curious notice to the effect that the Jews of Damascus told the Caliph 'Umar that the Antichrist would arise from the tribe of Benjamin (*Chron*, 212)

Of particular interest is what he has to say about the various sects that had arisen within Islam With some asperity he rejects the anthropomorphism of the Jabarites (*India*, 15), and what he calls the foolish rationalism of the Hashwiyya and Dahariyya who would not believe in anything that went beyond their own

experience (*Chron* 78) The two disastrous influences in early Islam, he says, were the Judaising sect who led away the unlearned by false copies of the Qur'ān they had in their possession, and the Zindīqs, who were really Manichees masquerading as the representatives of the true Islam (*India*, 132) He knows also of sects which arose among the Shī'a and corrupted their Code (*Chron* , 67), tells of a rascally missionary of the Harūrīyya sect (*Chron* , 201), of al-Muqannā' who claimed to be God (*Chron* , 211), and of those curious people the Qarmatians (*Chron* , 211–214) In discussing the Muslim festivals he takes occasion to recount how the festival of the first day of Muharram came to be associated with the family of 'Alī (*Chron* , 239)

The Sūfīs are those whom he introduces most often, because of the many points of contact he found between their teachings and Hindu thought (*India*, 4) He can compare their view of the soul with the Hindu *purusha* (*India*, 177, 178), their two soul theory with something similar in both Hindusim and Christianity (34), their notion of the liberation of the soul with the Hindu *moksha* (40, 41), their doctrine of metempsychosis with that commonly taught in India (29) He compares their doctrine of the First Cause with that of the Greeks (16), and explains how, like the author of the *Sāmkhya*, they do not regard the attainment of Paradise as any special gain, since absorption in its delights tends to divert the soul from the Absolute (31) He knows their doctrine of the veils of light and darkness that drop between man and God (43), and how they taught that *love* meant being engrossed by the creature instead of by the Creator (37) He quotes ash-Shibli and Bāyazīd al-Bistāmī on their pantheism (*India*, 43), and has quite an account of the extravagant doctrine of al-Hallāj, whose followers still at that time were carrying on his teaching (*Chron* , 211, 212)

This account of al-Bīrūnī's contribution to the study of Comparative Religion has had to be based on his *India* and his *Chronology*, the sole texts which were available, but it will suffice to show how important a place he has in the history of that study in general and within the fold of Islam in particular It is rare until modern times to find so fair and unprejudiced a statement of the views of other religions, so earnest an attempt to study them in the best sources, and such care to find a method which for this branch of study would be both rigorous and just Might it be after all that his greatest contribution to learning was not in the field of the more exact sciences but in this field of the sciences of the spirit ?

AL-BIRUNI AND TRIGONOMETRY

By

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The purpose of this article is to give a critical estimate of the merit of the THIRD BOOK of QANŪN-I-MAS'UDI as the first Compendium on Trigonometry written by the 'Most profound Thinker in Islam'[1] Muhammad Ibn Ahmad Abu'l Raihan Al-Biruni (4th Sept, 973 A D—11th Dec, 1048 A D) who was not only the most original and brilliant scholar at the court of Ghazna, but also was the greatest astronomer-mathematician the greatest historian-geographer of his age He was a tremendous writer who 'did never leave his pen except on two days, Nauroz and Mehrjān'[2], and produced works in practically every field of science and literature, which exceeded 'a camel's load'

He was the author of numerous books and articles[3] on diverse subjects such as philosophy, metaphysics, and religion, history, chronology, and civilization, art, fiction, and poetry, geology, geodesy, and geography, physiology, mineralogy, and medicine, optics, physics and chemistry, mapping and survey, and various branches of mathematics, astronomy and astrology Adept in Arabic and Sanskrit, in Greek, Hebrew and Syriac, and in many Indian and Iranian dialects he translated numerous works from these languages, and thereby linked the East and West at Ghazna

But it was in mathematics and astronomy where his creative genius mostly lay, and, to which he claims to be associated In the Preface to Qanūn-i-Mas'udi, his master-work on astronomy, astrology and mathematical geography, dedicated to Mas'ud, the son of Mahmud, he asserts, 'As I am connected with one of the branches of mathematics, and I am associated with it and deep in it since my birth, I prefer to serve his (Mas'ud) Treasury named 'Hikmat' by writing a treatise on the art astronomy (قانون صعب سحيم) . . I have adorned it with the best ornament '

Apart from his invention of a new type of astrolabe called Ustuwāni' which he used not only in observations of heavenly bodies, etc, but also in calculating the heights and distances of distant

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[1] Nallino Enc

[2] Shahrzori

[3] Chap IV 'Al-Biruni' by Syed Hasan Burney

objects, he wrote immensely on astronomical and mathematical topics such as Indian arithmetic, extraction of cube-root, ratio and proportion, calculation of heights and distances, direction of the qibla, balance and its correction, calculation of chords and tangents, construction of astrolabe and its use, time and its conception, days and nights, the moon and its phases, twilight, eclipses, comets and meteorites, horoscopes, Indian astrology measurement of the earth by observing the dip of the horizon,[1] methods of projection of bodies and spheres on planes, which he claims [2] to have put for the first time before the world His 'Tafhim', an introduction to astrology, meant for a lady named Raihana Bintul Hasan, is still extant

In short, he was an ocean of knowledge—a 'Sagar' [3] as Indian Pandits used to regard him, rather a 'magician' who could spell any one by his intellectual attainments

The book under consideration is mostly devoted to the plane trigonometry and trigonometrical tables except the last two chapters on spherical trigonometry It is Al-Biruni and not Nasiruddin Tusi (1201 1274 A D) as mentioned by Brammuhl [4] who for the first time approached trigonometry as an independent subject Nasiruddin himself seems to have based his trigonometry on that of Al-Biruni's He already talked highly of Al-Biruni's spherical trigonometry (مقاليد العلم ما حدث في مسطح الكره)[5] which has not yet come to light

Al-Biruni's predecessor Al-Battani (877–929 A D) was previously believed to be the real discoverer of trigonometry with his invention of the word 'Jaib', (of which sinus is a literal translation) for sine of an angle as half-chord of double the arc in a circle whose radius is 60 parts, but the researches of Burgess and Monk [6] and the statement of Al-Biruni [7] himself left no doubt as to its Indian origin Even tangent and cotangent which he defined as shadows of a rod 12 parts in length placed on horizontal and vertical planes respectively called ظل معكوس and ظل مستوى, have their origin not from him but from India [8] Al-Battani has no doubt the credit of using them for the first time in simplifying astronomical calculations in his Zich-el-Sabe [9]

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1 Incorporated in the seventh chapter of the fifth Book of the Qanūn

2 آثار الباقيه p 317, published by Edward Sachau

3 Al-Biruni in Indica

4 Gesch der Trig , p 66

5 See Nasiruddin Tusi, edited by Cartheodry

6 Brahmmuhl Gesch der Trig

7 Qanūn-i-Masudi Book III (Introduction, also Chapter VI)

8 Al-Biruni Book III of Qanūn, Chapter VIII

9 Edited by Nallino, 1899

Abul Wafa (940–998) added more to trigonometry and gave the formula that *tangent* $= \frac{sine}{cosine}$, and also, for the first time, defined all the trigonometrical functions and gave their mutual relations. He also pointed out that the tangent tables can be deduced from the sine tables by dividing the sine of the angle by the sine of its complement. He too based his calculations on the radius equal to 60, as all other Arab astronomers did except Al-Biruni who took the radius as unity.[1]

Al-Biruni developed the subject in a systematic way and has the credit of, for the first time, keeping it independent of astronomical calculations. His book on trigonometry has ten chapters, the first of which deals with the methods of calculating the sides of an equilateral triangle, a square, pentagon, hexagon, octagon and decagon for a given radius of the circle, and gives his own proof of determining the side of a decagon. He adds that the side of a heptagon cannot be found in terms of known numbers.[2] It is irrational. The method of determination of the side of a nonagon, he gives in a later chapter. As by definition, chord $\theta^\circ = 2 \sin \frac{\theta^\circ}{2}$, the values of $\sin 60^\circ$, $\sin 45^\circ$, $\sin 30^\circ$, $\sin 22\frac{1}{2}^\circ$ and $\sin 18^\circ$ were thus obtained.

Al-Biruni did not use, for his enunciations, numbers in abstract, but adopted the language of the Greek geometricians, e.g. instead of using the formula $S_8 = \sqrt{\gamma^2 - \gamma(\gamma\sqrt{2} - \gamma)}$ or $S_8 = \gamma\sqrt{2 - \sqrt{2}}$, he will say 'If we wish to find the chord of an octagon, we should multiply the radius by the difference of the radius and the chord of a square, and subtract the result from the square of the radius, and then extract the square root.'

The second chapter is devoted to finding the chord of complementary arc, the chords of double and half the arc, the chords of the sum and difference of two given arcs of known chords. Thus the formulae for $\sin \frac{\theta}{2}$, $\sin 2\theta$, $\sin(\theta + \varphi)$ and $\sin(\theta - \varphi)$ were established. The above theorems, he applied in determining the sines of multiples and sub-multiples of angles. The rule of finding the chord of double the arc is verified by the general theorem of

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[1] Nasiruddin Tusi, also see Introduction to Chapter VI of the Third Book of Qanūn.

[2] In Chapter IV, Book III, Al-Biruni remarks 'As his contemporaries Abu Sahl al-Kohi (988 A.D.) and Abuljud (1000 A.D.) have worked on it uselessly, he should not take pains to do it.' Cajori History of Mathematics.—Al-Kohi wrote *memoires* on the determination of the side of a heptagon inscribed in a circle. Abuljud solved the cubic $x^3 - x^2 - 2x + 1 = 0$ in constructing the side of a regular heptagon.

finding the chord of the sum of the arcs by supposing the two chords equal

The third chapter deals with the determination of the side of a nonagon from the side of an equilateral triangle This reduces to the problem of determining the chord of one-third of the given arc, or to find $\sin\frac{\theta}{3}$ if $\sin\theta$ is given Al-Biruni exhibits here a remarkable power of interpolation He was both an excellent geometrician and a great calculator Where need arises, he takes recourse to algebra He introduces, to get his result, in this case, a cubic equation $x^3 = 3x - 1$, and also changes the sexagesimal scale to the decimal scale only to extract the root The solution, which he gives of the above cubic, is correct to eight decimal places[1] if we verify the result by Horner's method of approximation to the root

The fourth chapter is very important, as in this he discusses the value of chord $1°$ or $\sin \frac{1}{2}°$, on which depends the accuracy of the tables It is here that he displays his great geometrical curiosity in deriving twelve geometrical relations after assuming that the trisection of an angle is possible One of these relations, he utilizes in interpolating the value of chord $1°$ from chord $3°$ He first criticizes the value of chord $1°$ calculated by Ptolemy by considering the ratios of the arcs for $1\frac{1}{2}°$ and $\frac{3}{4}°$, the chords of which Ptolemy had obtained by bisecting the difference of the chords of decagon and duodecagon $6°$ Al-Biruni shows that his method is correct only up to the second order He also badly criticizes one Yākub-al-Sehri who obtained chord $1°$ by first getting chord $3\frac{3}{4}°$ by addition theorem, and then getting chord $\frac{15°}{16}$ by bisection, and then committing the mathematical blunder of adding to it $\frac{1}{15}$ of the value of chord $\frac{15}{16}$ Al-Biruni ironically remarks 'Both the methods give results correct to the second order, but Ptolemy understood what he did, whilst Yākub did not know what he was doing '

Al-Biruni gives the following methods —

1 S_9 and S_{10} lead to chord $(40°-36°) =$ chord $4°$, which gives chord $2°$ and chord $1°$ by bisection

2 S_9 and S_{10} also lead to chord $10°$ and chord $12°$, hence chord $2°$ which by bisection gives chord $1°$

3 Interpolating the value of chord $1°$ by trisection of chord $3°$ This value, he finds out correct to the fifth order as $0°\ 1'\ 2''\ 49'''\ 51^{iv}\ 48^{v}$

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[1] Carl Schoy, p 19

The fifth chapter is on the calculation of the value of π. He first determines the ratios of the diameters to the perimeters of regular polygons of 180 sides, inscribed and circumscribed in the unit circle, which corresponds to $\frac{2}{360 \sin 1^\circ}$ and $\frac{2}{360 \tan 1^\circ}$. He, then, deduces that the value of π is intermediate between the two values $3^p\ 8'\ 29''\ 35'''\ 24^{IV}$ and $3^p\ 8'\ 30''\ 59'''\ 10^{IV}$, and applies Ptolemy's method of taking the arithmetic mean between the two values, and thus getting the result correct to the sixth order as $3^p\ 8'\ 30''\ 17'''\ 46^{IV}\ 46^{V}\ 30^{VI}$. He further transforms the whole thing to the vulgar fraction as $\frac{1628681471}{518400000}$ which comes out as 3.1417482. It was for the first time perhaps that Al-Biruni gave the result so correctly. Al-Biruni also knew how to transfer the sexagesimal scale into vulgar fraction and vice versa.

The chapters VI and VII are devoted to the Sine Tables. He calculated the tables to the third order correct to six places of decimals. The only remarkable advancement was that in calculation the radius of the circle was taken as unity instead of sixty as was usual, and the period of the tables being at an interval of 15' i.e. $\frac{1}{4}^\circ$. Al-Biruni, himself remarks that 'starting with radius equal to one' has saved him the labour of multiplication, division and reduction to degrees, etc.

An extract of his Sine Tables is as follows:—

Satr add-al-Qusi		al-Juyūb				at-Ta'ādil*				Al-Fudūl		
°	'	'	''	'''	IV	'	''	'''	IV	'	'''	IV
24	0	24	24	15	7	0	57	20	32	14	20	8
	15	24	38	35	15	0	57	13	16	14	18	29
	30	24	52	53	44	0	57	7	4	14	16	46
	45	25	7	10	30	0	57	0	8	14	15	2
25	0	25	21	25	32	0	56	53	16	14	13	19

The first column gives the arcs, the second their sines, the third 'equalisations', and the fourth their 'differences'. The column of 'equalisations' or تعديل is calculated to avoid the trouble of

* *Tā'ādil* = equalizations, *Fuḍul* = differences

multiplying each time by four If U_{-1}, T_{-1}, Δ_{-1} be the values of sines, *Ta'ādil* and difference for the angle $\alpha-\frac{1}{4}$, and U_0, T_0, Δ_0; U_1, T_1, Δ_1, the corresponding values for the angle α and $\alpha+\frac{1}{4}$ respectively, T being equal to 4Δ Al-Biruni gives the following two methods for approximating the sine of an intermediary angle

(1) $\sin(\alpha+x) = U_0+xT_0 = U_0+4x\Delta_0 \quad [x<\frac{1}{4}^\circ, T_0 = 4\Delta_0]$

(2) $\sin(\alpha+x) = U_0+4x\Delta_{-1}-(4x)^2(\Delta_{-1}-\Delta_0)$

This shows that Al-Biruni knew that the sine of an angle can be expanded in terms of a polynomial He uses finite differences for the purpose of interpolation His second formula which was given by him for the first time corresponds very approximately to Newton's interpolation formula

$$f(X) = f(a)+\frac{X-a}{\underline{|1}}\frac{\Delta f(a)}{h}+\frac{(X-a)(X-a-h)}{\underline{|2}}\frac{\Delta^2 f(a)}{h^2}+$$

where Δ, Δ^2 etc are the first and second differences, h, the common difference for which the tables are calculated

Comparing this to Al-Biruni's formula, we observe that he has neglected the third and the fourth terms etc, perhaps, because he wanted his results only correct to six decimal places Let $h = \frac{1}{4}$, $f = \sin$, $X = x+\alpha$ where $x<\frac{1}{4}$, $a = \alpha-\frac{1}{4}$ then Newton's formula gives —

$$\text{Sin}(x+\alpha) = U_{-1}+\frac{x+\frac{1}{4}}{\frac{1}{4}}(U_0-U_{-1})+\frac{(x+\frac{1}{4})(x)}{\underline{|2}}\frac{[U_1-2U_0+U_{-1}]}{(\frac{1}{4})^2}+$$

$$= U_{-1}+(U_0-U_{-1})+4x(U_0-U_{-1})+\frac{16x(x+\frac{1}{4})}{2}[(U_1-U_0)-(U_0-U_{-1})]+$$

$$= U_0+4x\Delta_{-1}+\frac{16x(x+\frac{1}{4})}{2}[\Delta_0-\Delta_{-1}]+$$

$$= U_0+4x\Delta_{-1}+(4x)^2[\Delta-\Delta_{-1}]$$

if in the third term we regard $\frac{1}{4}$ as x, because no appreciable error will occur in the second approximation

Al-Biruni also gives two inverse interpolation formulae for determining the approximate angle corresponding to an intermediate value of sine These formulae are derivable from (1) and (2) above For, if x is an increment on α, and other notations have their own meaning, then —

(a) $x = \dfrac{U_{0+x}-U_0}{T_0}$ from (1)

(b) $x = \dfrac{15'\,(U_{0+x}\;\; U_0)\,\Delta_0}{\Delta_{-1}\,\Delta_0-[U_{0+x}-U_0](\Delta_{-1}-\Delta_0)}$

For $U_{0+x} = U_0 + 4x\Delta_{-1} - (4x)^2(\Delta_{-1} - \Delta_0)$ from (2)

or $$4x = \frac{U_{0+x} - U_0}{\Delta_{-1} - 4x(\Delta_{-1} - \Delta_0)}$$

or $$4x = \frac{U_{0+x} - U_0}{\Delta_{-1} - \dfrac{U_{0+x} - U_0}{\Delta_0}[\Delta_{-1} - \Delta_0]}$$ from (1)

or $$x = \frac{\frac{1}{4}\Delta_0(U_{0+x} - U_0)}{\Delta_{-1}\Delta_0 - (U_{0+x} - U_0)(\Delta_{-1} - \Delta_0)}$$

This is the first example of calculus of finite differences appearing in classical mathematics The formulae derived by Al-Biruni seemed to have gone into background till they appear again in the 17th century[1] of the Christian Era in the modified form The credit of invention of calculus of finite differences should, therefore, go to our hero Al-Biruni

The eighth chapter deals with 'Shadows', their forms as *Umbra Versa* and *Umbra Recta* (ظل معكوس and ظل مستوى), and their tables In our own terminology, he treats, in details, the tangents and cotangents and further establishes expressions for secant, cosecant, sine and cosine, versine and coversine in terms of tangents and cotangents, and vice versa He calculates the tangents tables from those of sines, using the formula $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

It was here he remarks 'The length of the measuring rod (*miqyās*) for the shadows was generally taken as twelve parts (fingers) for *Umbra Recta* This was what Indian astronomers always used to do ' It shows how high was the sense of integrity in him as always to acknowledge the work done by others Now it is clear that Al-Battani, in this respect also, is indebted to India

Al-Biruni in this chapter also gives with proof the interpolation formula for intermediary values of tangents similar to those for sines, and, in the end, generalizes his interpolation formula for intermediary values in the language of the theory of function, though the word 'function' does not occur The following is the translation of the text 'The METHOD OF FINDING MORE APPROXIMATELY FROM ANY TABLE WHATSOEVER'[2]

'Whatever part you have got from the sine, arc, or tangent, find out in the given table nearest to that part and keep it, also find out corresponding to the *part a unit part less*[3] than the *found-*

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[1] *See* Freeman, Part II
[2] Last article, Chapter VIII Book III of Qanun
[3] The common difference for which the Table is calculated

out-part and take their difference, call it the 'first difference', find also the *part a unit part more than the found-out-part*, and take their difference call it the 'second difference' Now multiply the fraction of the unit part which is left out by the difference of the first and second differences If the first difference be less than the second difference, then add the result to the first difference, and if the first difference be greater than the second, then subtract the result from the first difference Then multiply this result again by the fraction of the Unit part left out, and add this to the found-out-part, provided the part a unit part more than the found-out-part be greater than the found-out-part (function increasing), and subtract thus provided the part a unit part more be less (function decreasing)'

In the functional notation, if x is the part left out, h the Unit part, $F(a)$, the found-out-part, then $F(a)-F(a-h)$ is the first difference $F(a+h)$ is the second difference, then

$$F(a+x) = F(a)+\frac{x}{h}[F(a)-F(a-h)]+\frac{x^2}{h^2}\Big\{[F(a+h)-F(a)]-[F(a)-F(a-h)]\Big\}\quad x < h, \text{ and function is increasing}$$

$$F(a+x) = F(a)-\frac{x}{h}[F(a-h)-F(a)]+\frac{x^2}{h^2}\Big\{[F(a-h)-F(a)]-[F(a)-F(a+h)]\Big\}\quad x < h, \text{ and function is decreasing}$$

The above theorem again corresponds to the interpolation formula given as below

$$F(a+x) = F(a)+\frac{x}{h}[F(a)-F(a-h)]+\frac{\frac{x}{h}\left(\frac{x}{h}+1\right)}{\underline{|2}}\Big[F(a+h)-2F(a)+F(a-h)\Big]+$$

$$\text{where } \frac{x}{h} < 1$$

Al-Biruni only considers three terms, and in the last term, to approximate the result, supposes 1 to 6 x/h, which reduces the Formula to his form The genius of Al-Biruni needs no comment I think, probably, it is the only instance, either in the Middle Ages or in the classical period, that a general theorem is formulated in the language of the theory of function

The ninth and the tenth chapters deal with relations between sines and tangents of great circular arcs in the figures formed by pairs of intersecting quadrants

If R is the pole of AC, and A the pole of RC, and if any other quadrants AD and RB intersect at T, then Al-Biruni proves very important properties such as

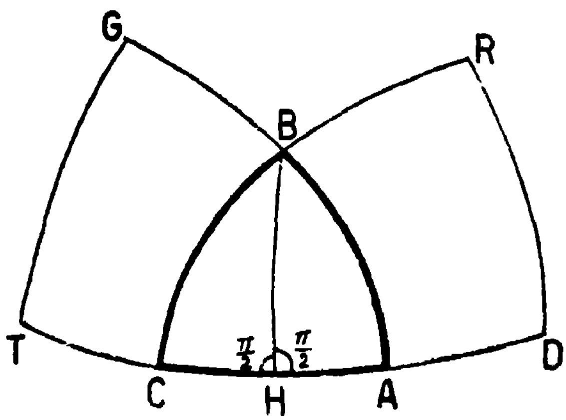
$$\text{(i)}\quad \frac{\sin RT}{\sin DT} = \frac{\sin RB}{\sin BC} \qquad \text{(ii)}\quad \frac{\sin RD}{\sin RC} = \frac{\tan DT}{\tan BC}$$

These properties, he has applied throughout the chapters of the QANUN, for instance, in the fourth book in chapters XII, XIV, XVII and XVIII On determination of eastern and western amplitudes of a heavenly body, On determination of altitude from azimuth, On computation of the equation of day and latitude thereof, On determination of ascensions of signs of ecliptic The proof of sine formula of spherical trigonometry, i e

$$\frac{\sin A}{\sin a} = \frac{\sin B}{\sin b} = \frac{\sin C}{\sin c}$$

is given in a very elegant way as follows

Let ABC be a spherical triangle Produce AC, AB, CA CB



such that AT AG, CD, CR each is equal to a quadrant Join GT and RD which will be equal to the spherical angles A and C respectively, because A is the pole of GT, and C the pole of RD Draw BH perpendicular to CA Then, from Property (i) above, $\sin AB/\sin BH = \sin AG/\sin GT = 1/\sin A$, also, $\sin BC/\sin BH = \sin CR/\sin RD = 1/\sin C$ This gives, by division, $\sin A/\sin a = \sin C/\sin c$ Similarly, for the other ratios

In chapter VIII, he has also given a very beautiful proof of the sine formula of plane triangles, i e

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

None of his predecessors, from Ptolemy to Battani proved the sine formula Ghabir bin Aflah [1] who lived in 1085 A D at Seville in

[1] Cajory History of Mathematics

Spain forty years after Al-Biruni's death, knew the formula But it is quite probable that he might have possessed the works of Al-Biruni, as it seems that he has tried to imitate the style of Qanun-i-Mas'udi by writing an Astronomy in nine books, the first being on trigonometry just like the eleven books of the Qanun, the third being on trigonometry Full justice to Al-Biruni's contributions to trigonometry is only possible when the spherical trigonometry of Al-Biruni مقالته العلم ما حدث ق بسط الكره[1] will be somewhere available I am sure, he must have perfected the subject

How astounding it looks to modern mathematicians that a person existing thousand years back happens to produce so much original work in spite of very little resources of those times, at the same time plays a considerable part in diverse fields with astonishing accuracy and mathematical care The world still knows very little of Al-Biruni as a great mathematician, and many of his original contributions to mathematics still lie hidden in the pages of his master-work the *Qanun-i-Mas'udi*, and in many of his other books which perhaps may never come to light

It is really sad that no oriental mathematician-scholar has so far taken up the task of translating the *Qanun-i-Mas'udi* to its entirety The translations of some of the books from the manuscript of this work in the Lytton Library, M U Aligarh, have no doubt been attempted in Urdu by late Maulana Rāghib Badāūni at the instance of late Sir Shah Sulaiman, but due to his ignorance of mathematics, he could not succeed

Let us hope that the day is not far off when this great astronomer, who was the first to observe and solemnly assert[2] that the assumption 'that the Earth moves round the Sun' could not be disproved, and the explanation of which was later given by Copernicus (1473-1543) in his helio-centric theory, will shine like the most brilliant star of all times in the firmament of fame and glory

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[1] Nasiruddin Tusi

[2] Molvi Enayatullah Beg *Hilāt-i-Al-Biruni*

ON THE MINOR TRACTS OF ABU-RAĪHAN MUHAMMAD BIN AHMAD AL-BERUNI

By

MOHD ABDUR RAHMAN KHAN,

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(Retired) *

Al Beruni was born on 3rd Dhu-l'hijja A H 362 (4th December, 973) and died as is generally believed, on 2nd Rajab 440 (11th December, 1048) but according to Max Meyerhof in 1050 He was a native of Khwarizm and lived under the patronage of the House of Māmūn, formerly vassals of the Sammanian Kings of Central Asia For some years he lived also in Jurjan, perhaps at the Court of Qa'bus ben Washingir Shams-al-Ma'āli, and dedicated to him about A H 390-391 (A D 1000) his famous Arabic work آثار الباقية عن القرون الخالية (translated into English and edited with Notes by Edward Sachau of the University of Berlin) It is a monumental work 'containing technical and historical details for the compilation of time invented and used by the Persians, Sogdians, Khwarizmians, Jews, Syrians, Harranians and others, together with Greek traditions '

He returned to Khwarizm and lived there during A H 400-407 At the conquest of the country by Sultan Mahmūd of Ghazneh (A H 407), he was carried off along with other scholars to Afghanistan in A H 408 From now on he occupied himself with research over a wide field of subjects mathematics astronomy, natural sciences, etc While in India he made a deep study of its geography, history, language and literature (Sanskrit) and carefully observed the manners and customs of its people—, all recorded in his Kitab-al-Hind, composed in Ghaznah in 1030—(edited by Sachau in 1887, English translation with elaborate introduction and notes in 2 vols in 1889 and reprinted in 1910)

George Sarton tells us that al-Beruni was an admirer of Hindu philosophy especially of the Bhagvadgita and translated several works from Sanskrit into Arabic (e g , two of Varahamihira's works

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* Fellow of the Royal Astronomical Society, Research Associate of the Institute of Meteoritics, the University of New Mexico U S A President the Hyderabad Academy, etc

of the first half of the sixth century A D) He also transmitted Muslim knowledge to the Hindus He gave the best Mediaeval account of the Hindu numerals and solved interesting problems of the game of chess

He wrote both in Arabic and Persian, knew perhaps a little Hebrew and Syriac, but seems to have been ignorant of Greek. Nevertheless he thoroughly knew the Greek masterpieces in mathematics and astronomy through Arabic and Syriac versions His كتاب التفهيم لاوائل صناعة التنجيم written in Ghaznah in Arabic (original text with English translation by R Ramsay Wright, London, 1934) is a masterpiece of scientific observations and well repays careful study by modern scientists as well His astronomical encyclopaedia القانون المسعودى فى الهيئة و النجوم dedicated in 1030 to Sultan Mas'ūd, son of Sultan Mahmūd, is a great work still awaiting careful translation and edition

Among his other activities he discussed geometrical methods of trisecting plane angles and other problems which cannot be solved with ruler and compass alone, (that came to be known later as Alberunic problems), simplified stereographic projection (similar to that published by G B Niccolosi di Paterno in 1660, Isis V, 498), described accurate methods of determining latitudes and longitudes and wrote on geodetic measurements He discussed the question of the Earth's rotation on its axis, but failed to reach a definite conclusion, possibly for want of adequate scientific data

He deduced values experimentally for the specific gravities of 18 precious stones and metals, that are remarkably accurate He knew that the speed of light was immensely greater than that of sound, explained on hydrostatic principles the ascent of water in natural springs and artesian wells As a keen observer of natural phenomena he marked carefully the succession of changes in the light of the sky at dawn and dusk, and was thus the first accurate observer and describer of the Zodiacal Light (*vide* Hyderabad Academy Studies, No 2, 1940) He was interested in botany, zoology and geology also, as is evident from his remark that flowers have 3, 4, 5 6 or 18 petals, never 7 or 9, and from his book of Drug-Knowledge (Kitab-us-Saydana), from his description of monstrosities including the so-called Siamese Twins, and from his suggestion that the Indus Valley was at one time a sea-basin, now filled up with alluvious matter

(Max Meyerhof's article in Isis, vol 37, May 1947, pp 32–36, the Earliest Mention of a 'Manniparous Insect' describes al-Beruni's account of Bishr al-Fazari's views on exudation of 'honey-dew' طل العسل by the action of an insect living between the leaves of a plant called العاج by Arab writers)

Al-Beruni's influence on scientific research long survived his death His pupils and pupils' pupils carried on the work he had started with commendable diligence, as is borne out by the appearance of a number of scientific *Rasa'il* or pamphlets dedicated to his memory, amongst which the following tracts have been published by the Dāirat-ul-Ma'ārif lately [1]

١ — المقاله لابراهيم بن سنان فى طريق التحليل و التركيب و سائر الاعمال فى المسائل الهندسيه *

٢ — المقاله لابراهيم بن سنان بن ثابت بن قره فى رسم القطوع الثلاثه *

٣ — المقاله لابراهيم بن سنان فى الاسطرلاب *

٤ — المقاله فى الابعاد و الاجرام *

٥ — الرساله فى اقامه البرهان على الدائر من الفلك من قوس النهار و ارتفاع نصف النهار و ارتفاع الوقت *

٦ — الرساله فى براهين اعمال جدول التقويم فى زيج حبش الحاسب *

٧ — الرساله المسماه جدول الدقائق *

٨ — الرساله فى البرهان على عمل محمد بن الصباح فى امتحان الشمس *

٩ — الرساله فى الدوائر التى تحد الساعات الزمانيه *

١٠ — الرساله فى البرهان على عمل حبش فى مطالع السمت فى زيجه *

١١ — الرساله فى معرفه القسى الفلكيه *

١٢ — رساله ابى نصر فى كشف عوارى الباطنيه لما موهوا على رويه الاهله *

١٣ — الرساله فى حل شبه فى المقاله الثالثه عشر من كتاب الاصول *

١٤ — فصل من كتاب لابى نصر فى كريه السماء *

١٥ — المقاله فى استخراج ساعات ما بين طلوع الفجر و الشمس كل يوم من ايام السنه بمدينه فاس *

١٦ — المقاله فى استخراج تاريخ اليهود و اعيادهم للخوارزمى *

١٧ — المقاله فى استخراج تاريخ اليهود ابى ناسداد القاسى *

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1 See the Cat of Arabic MSS Oriental Public Library, Bankipore, vol xxii, page 60

١٨ — الكتاب فى حركات السمس *

١٩ — الكتاب فى مسلحقة القطع المحروط المكافى *

٢٠ — كتاب ارسمدس فى الدوائر المماسه *

٢١ — كتاب ارسمدس فى اصول الهندسه *

٢٢ — الفصل فى خطط الساعات الرمانيه فى كل فيه او فى فيه يستعمل لها *

٢٣ — الرساله فى المقادير المشتركه و المبائنه *

٢٤ — كتاب اساط الماه الحفيه للحارق *

The following are under publication and are expected to be ready soon

١ — الرساله فى اصول الرصد *

٢ — رساله ابراهيم بن سنان بن ثابت فى وصف المعانى التى استخرجها فى الهندسه و النجوم *

٣ — الرساله فى تصحيح ما وقع لابى جعفر الخازن فى السهو فى زيج الصفائح *

٤ — المقاله فى اصلاح شكل من كتاب الاناوس فى الكريات *

٥ — المقاله فى البرهان على حقيقة المسئله التى وقعت بين ابى حامد الصغانى و بين منجمى الرى فيها منازعه *

٦ — الرساله فى مجازات دوائر السموت فى الاسطرلاب *

٧ — الرساله فى صنعة الاسطرلاب بالطريق الصناعى *

٨ — رساله ابى نصر فى جواب مسائل الهندسه *

٩ — قول ابن الهيثم فى خواص المثلث من جهة العمود *

١٠ — الرساله فى مسلحة المجسم المكافى *

١١ — افراد المقال فى امر الظلال *

١٢ — المقاله فى راسكات الهند *

١٣ — تمهيد المستقر فى معانى الممر *

١٤ — الكتاب فى كيفيه تسطيح الكره على سطح الاسطرلاب *

١٥ — الرساله فى الشكل القطاع *

١٦ — الرساله فى ان الاشكال كلها من الدائره *

١٧ — الكتاب فى استخراج الاوتار فى الدائره بخواص الخط المنحنى الواقع فيها *

Mention must also be made of 'Abdur Rahmān, al-Khāzini's 'Mizān-ul-Hikmat completed in 1121 or 1122, in which full tribute is paid to al-Beruni's genius as an experimental and analytical scientist There is no doubt whatsoever that al-Beruni was one of the greatest scientists of all times and as Sachau remarks, 'the work of generations will be required to do full justice to al-Beruni'

It is a source of great satisfaction to observe that the مجموعه رسائل البيرونى referred to above has been printed by the Dāirat-ul-Ma'ārif, Osmania University, Hyderabad It will go a long way to rouse the interest of the modern scientific world in the grand achievements of the great Muslim philosopher of the 11th century, the greatest of his time, and one of the greatest of all times

AL-BIRUNI'S DETERMINATION OF GEOGRAPHICAL LONGITUDE BY MEASURING THE DISTANCES

By

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Leiden University

In the second chapter of the sixth treatise of *al-Qānūn al-Mas'ūdī* al-Biruni explains a method of determining the difference in geographical longitude between two places by measuring the distance between them in common measures and then using these data in a rather intricate mathematical calculation This chapter has been rendered into German by C Schoy in an article entitled *Aus der astronomischen Geographie der Araber*, which has appeared in *Isis*, Vol V (1923), pp 51–74 [1] As the translation given by Schoy contains not a few errors on the linguistic side, I am giving here an English translation which I consider more correct After that I propose to present some observations on various points raised by the text, which are of a nature to give some more insight into the way of working of the celebrated Islamic astronomer and mathematician

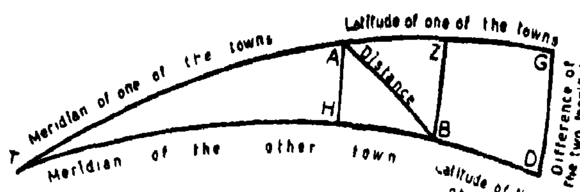
My remarks do not bear on the theoretical side of al-Biruni's reasoning, which has been set forth with great lucidity and exactitude by the eminent German scholar in his aforesaid article

The theory itself is not difficult to grasp Al-Biruni considers the distance between two places *A* and *B* the latitudes of which are known, as one of the diagonals of a spherical quadrangle, which is formed by sections of the meridians passing over *A* and *B* as one pair of opposite sides, and sections of the parallel circles passing over *A* and *B* as the other pair of opposite sides [2] In this quadrangle *AHBZ*, the sides *AZ* and *HB* are equal and they represent the difference in latitude of *A* and *B* The length of all these sides can be expressed in degrees of the earth circumference and their parts. Now al-Biruni converts the spherical quadrangle into a planimetrical quadrangle by substituting for the spherical lines or arcs the corresponding chords, the length of which is expressed in radials and their sexagesimal parts (one radial being half of the earth's diameter)

[1] Some sections of the chapter have also been published in Arabic and French translation in *Monumenta Geographica Africae et Aegypti* by Prince Youssouf Kamal, Tom III, Fasc III (Leiden 1933) fol 713

[2] In the letters of the figure, which is a copy of that found in the manuscripts, the Arabic phonetic value is followed as much as possible The same transcription is used by Schoy

Then *AHBZ* becomes a trapezium and, as its angles lie on the circumference of a circle, the quadrangle is governed by the so-called theorem of Ptolemy, which states that the product of the diagonals (in this case the square of one diagonal) is equal to the sum of the products of each pair of opposite sides In this case $AB \times ZH = AZ \times HB + AH \times BZ$ or $AB^2 = AZ^2 + AH \times BZ$ This enables him to find $AH \times BZ$ by subtracting the square of *AZ* (the distance between the two latitudes) from the square of *AB* (the distance between the two places) In order to determine *AH* and *BZ* the author considers these lines as chords of concentric circles (the parallels running through *A* and *B*), their ratio is equal to the ratio between the radii of these circles and these radii can be known, as they are the cosinus lines of the angles belonging to the known latitudes of *A* and *B* So after having ascertained these cosines (expressed in radials) he is able to calculate the length of *AH* in radials Finally he has to find out how much this is in equatorial degrees Therefore he has to determine the distance between the intersections of the meridians of *A* and *B* and the equator, namely the line *GD* By a similar reasoning as the foregoing he points out that the ratio between *AH* and *GD* is equal to the ratio between the radius of the parallel of *A* (the cosinus of its latitude) and the radius of the equator, which is 1 radial After having computed in this way the straight line *GD*, he converts this again into an arc of the equator and so obtains the longitudinal degrees and their parts which express the difference in geographical length between *G* and *D* as well as between *A* and *B* This last result was the aim of the calculation



In his article Schoy has also treated of another method of al-Biruni's to find longitudinal differences, which is expounded in the second chapter of the fifth treatise of the *Qānūn* This method is purely trigonometrical and will not be dealt with in this place

For the Arabic text Schoy has used the MS Orient Oct 275 of the Preussische Staatsbibliothek in Berlin and photographs of the incomplete MS Or 1997 of the British Museum and of the MS Or 516 of the Bodleyana at Oxford I have been able to consult the same London MS as Schoy and the MS Acc Or 1927 No 213 of the Pr St-Bibl at Berlin[1] The latter manuscript,

[1] Cf Brockelmann, *G A L*, Suppl I, 873

which was acquired only after Schoy had written his paper, was finished the 29th Rab I, 562 (22 Febr 1167) and gives the impression of having been very carefully copied The London MS was written in 570 (1174), while the Oxford MS dates from 475 (1082) There is a fairly good agreement between the second Berlin MS and the London MS The differences are to be found mainly in the figures used in the computation These figures are rendered as usual in Arabic letters and, as is well known, these are especially apt to confound the figures for 10 and 50 by a wrong (or lacking) punctuation (د for ن and vice versa) and those for 3 and 8 (8 being written as ح and 3 by the same letter, but with an incomplete downstrike ـ) Very often dubious cases can be settled by the probability of the calculation described in the text Where there is a notable difference between the manuscripts or with regard to Schoy's text it has been indicated in the notes

Translation

Second chapter (of the sixth treatise) on the verification of the longitudes of Ghazna and al-Iskandarīya

(1) As we wish to establish the movements of the stars in relation to the meridian of the town of Ghazna, it is necessary that we first determine (the position of) that place in the 'inhabited part of the earth', so that the transfer of the time moments (اوقات *awqat*) in the various towns to that place may be in accordance with the longitudinal difference existing between those places

(2) As to Ghazna this place is situated on the parallel which runs at a distance of thirty-three parts (degrees) plus one-third plus one-fourth north of the equator, while its meridian advances the meridian of Baghdad by twenty-four time units (ازمان *azmān*, viz degrees) plus one-third to the east

(3) The method by which we have ascertained this is that we have proceeded to the observation of its latitude by means of the '*yamīnī* ring', which is subdivided into minutes in such a way that the division comprises each time eight of them (المقسومة بالدقائق قسمة وسعت ثمين كلّ واحدة منها (*al-maqsūma bi'l-daqā'iq qismatan wasi'at tathmīna kull wāhidatin minhā*) This observation was executed in each of the years 409 and 410 of the Hijra (20 May 1018 to 8 May 1019 and 9 May 1019 to 26 April 1020) [1]

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[1] Schoy erroneously gives as the corresponding years of the Christian era 1011/12 and 1012/13

(4) So we take, in order to learn how it is with its longitude, the town of Shiraz as an intermediary between it (Ghazna) and Baghdad Now let *A* be Baghdad on the meridian *TAG* and *B* Shiraz on the meridian *TBD* and let *GD* be the difference between both places, expressed in time units of the celestial equator (ازمان معدّل النهار *azmān mu'addil 'l-nahār*, i e equatorial degrees), and *AB* the distance between the two towns This distance is hundred and seventy farsakhs, for the greater part flat country, in which it is approved (مستحسن *mustahsan*) to drop the tenth part, in order to relieve it from the curvature of the roads and to bring it near to a straight stretch Hereby the number of farsakhs becomes hundred and fifty-three, which, expressed in parts, is $8° 6' 0''$

(5) We draw now round the pole *T* and with the distance of each of the two towns, the two circular lines *AH* and *BZ* [1] It is clear that the quadrangle formed by the chords *AZ*, *ZB*, *BH* and *AH* is comprised in a circle, because its angles are on the spherical surface, while its surface cuts the sphere, describing in this way a circle Also that the quadrangle has two equal sides, *AZ* and *HB*, and two unequal sides, *AH* and *ZB*, which are parallels It follows that the square of the chord *AB* is equal to the square of the chord *AZ*, added to the product of the chord *AH* and the chord *ZB* The chord *AB* is 0 8 28 32 [2]

(6) The latitude of Baghdad is $33° 25'$ and the latitude of Shiraz, according to the observation of Abu l-Husain [3] ibn al Sūfī together with a number of scholars by means of the '*adudī* ring', $29° 36'$ The chord of the difference between these two latitudes is 0 3 59 46 Now when we subtract the square of this from the square of the chord *AB* we obtain the product of the chords *AH* and *BZ* The ratio of this product to the square of the chord *AH* is equal to the ratio of the chord *ZB* to the chord *AH* Now the ratio of the chords of concentric arcs (القسيّ المتشابهة *al-qisī al-mutašābiha*, viz المتشابهة النقطة *al-mutašābihat al-nuqṭa*) is the same as the ratio between the diameters of their circles So this is the ratio between the sinus of *TB* and the sinus of *TA*, namely between the half diameter of the circular line *BZ* and the half diameter of the circular line *AH* The cosinus of the latitude of Baghdad is 0 50 4 12 [4] and

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[1] MS London erroneously *Z* only

[2] This should strictly be rendered $0^{r}\ 8'\ 28''\ 32'''$ but for convenience sake I omit in the figures given in radials the indication of minutes, etc The text does the same and is not less clear for it

[3] MS L Abū'l-Hasan

[4] MS L 0 50 3 12, B 0 55 4 12, Schoy 0 50 3 2

the cosinus of the latitude of Shiraz is 0 52 10 16[1] So the chord *AH* becomes 0 7 28 27 The ratio between this and the sinus of *AT* is equal to the ratio between the chord of *GD* and the sinus of *GT*, which is a quarter (an angle of 90°) It follows that the chord of *GD*[2] is 0 8 57 16, the arc of which is 8° 33′ 32″ This is the difference between the two longitudes

(7) We have already said that the latitude of Baghdad from the shore of the encircling ocean is seventy time units Then the longitude of Shiraz is 78° 33′ 32″ In the books this is given as 79° 0′ So the two results are near to each other and the two methods cover each other

(8) As to the distance between the towns of Shiraz and Ghazna, the distance from Shiraz to al-Sīrajān in the country of Kirmān is seventy-eight[3] farsakhs, then to the beginning of the desert forty-seven, then to Zaranj, the capital of Sijistān, seventy, then to the town of Bust sixty, then to Ghazna eighty When we correct this partially by subtracting a seventh part and partially by subtracting a sixth part, according to a conjecture made while traversing these distances, the number of corrected farsakhs which remains is two hundred and eighty-four The parts of this distance are 15° 2′ 7″[4] and the corresponding chord is 0 15 41 59

(9) We make Ghazna *A* in the preceding figure and Shiraz *B* The chord of the difference between these two towns is 0 4 10 14 Now when we follow the same method with regard to this as before, the chord *AH* proves to be 0 14 50 6[5] The cosinus[6] of the latitude of Ghazna is 0 49 59 5, so that the chord *GD* becomes 0 17 3 43 and the corresponding arc 16° 20′ 54″ When we add this to the longitude of Shiraz, the addition gives as the longitude of Ghazna 94° 54′ 26″

(10) Let us now turn from Baghdad to the other side and let in the foregoing figure *A* be al-Rayy and *B* Baghdad The distance between these two places expressed in farsakhs, after correction by means of subtracting one-sixth, is hundred and thirty-two In parts this is 7° 5′ 21″, the corresponding arc being 0 7 19 54[7] The latitude of al Rayy, according to the observation of Abu'l-Fadl al-Harawī and Abū Mahmūd al-Khujandī is 34° 35′,[8] the cosinus of which is 0 48 47 59 The chord of the difference between the two latitudes is 0 2 15 45 The chord *AH* becomes 0 6 53 2[9] and

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[1] So MS B L has 0 52 10 46 and Schoy 0 52 10 17

[2] The passage ending here and beginning with 'and the sinus of GT ' is lacking in L

[3] Schoy has 98, which must be an error

[4] L 15° 4′ 7″

[5] B 0 14 55 6

[6] L sinus

[7] B 0 7 59 54, L 0 7 19 (or 59) 54, Schoy 0 7 19 14

[8] L 35° 35′

[9] So L and B , Schoy 0 6 13 2

the chord *GD* 0 8 27 50[1] The corresponding arc of this is 8° 5′ 20″, the difference between both latitudes

(11) We have already said that we have found the latitude of al-Jurjānīya in Khwārizm by means of the '*shāhī* ring' to be 42° 17′, the cosinus of which is 0 44 23 22 The distance between al-Rayy and this town, expressed in farsakhs after correction by means of subtracting one-sixth, is hundred and fifty four The parts of this distance are 8° 10′ 14″, of which the chord is 0 8 33 16 The chord of the distance between both latitudes is 0 7 1 5 The chord *AH* becomes 0 4 39 54 and the chord *GD* 0 6 18 20 The corresponding arc of this is 6° 1′ 26″, the difference between the two longitudes

(12) The distance between al-Jurjānīya and Ghazna is two hundred and thirty farsakhs at the utmost (في غاية الطول *fī-ghāyat al-ṭūl*) When this is taken as authoritative (رسمية *rasmīyatan*) it has no need of correction to make it straight The parts of this distance are 12° 10′ 37″, of which the corresponding chord is 0 12 43 40 Now let al-Jurjānīya be *A* and Ghazna *B* The chord of the difference between the two latitudes is 0 9 6 7 The chord *AH* becomes 0 8 23 2 and the chord *GD* 0 10 3 50[2] The corresponding arc of this is 9° 37′ 16″, the difference between both longitudes

(13) Now if we make an addition of the time units which have been found between these towns, we obtain 23° 44′ 2″ So the longitude of Ghazna, according to this computation, is 93° 44′ 2″ The result of the computation from the side of Shiraz was 94° 54′ 26″ Half the sum of both these figures, according to the rule (رسم *rasm*) of the arithmeticians, is 94° 19′ 14″ Thus it has been established that Ghazna is situated at twenty-four time units and one-third east of Baghdad

(14) After this it is necessary for us to know how great is the difference in latitude between her (Ghazna) and al-Iskandarīya The Almagest states that this latter place lies one-half and a third hour to the west of Bābil and that its latitude is 30° 58 The position of Bābil is near to Baghdad So we have to consider what he tells, for no doubt he has found it thus in the books, just as we find similar statements in them to deviate from the truth

(15) Al-Raqqa is intermediate between both towns and Muhammad ibn 'Abd al-'Azīz al-Hāshimī says that which is found between al-Raqqa and Baghdad by observation of a lunar eclipse, of which he mentions the date, is seven time units Now let in the preceding figure *B* be Baghdad and *A* al-Raqqa The latitude of

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[1] B. 0 8 27 55

[2] B 0 10 3 55

this town, according to the observation of Muḥammad ibn Jābir al-Battānī, is 36° 1′ The cosinus of this is 0 48 31 51 and the chord of the difference between both latitudes is 0 2 43 21 The distance between Baghdad and al-Raqqa is hundred and thirty farsakhs So, if we take this as approximately hundred and ten by means of a correction of one-sixth, the number of parts is 5° 49′ 34″,[1] the chord of which is 0 6 5 54 [2] The chord *AH* becomes 0 5 32 36 and *GD* 0 6 38 28 The corresponding arc is 6° 20′ 43″, the difference between both longitudes

(16) As to the difference between al-Raqqa and al-Iskandarīya, the distance, corrected by one-sixth, becomes six hundred and twenty-eight miles, which is 11° 4′ 56″,[3] the chord of which is 0 11 35 14 [4] The chord of the difference between both latitudes is 0 5 17 12 [5] The chord *AH* becomes 0 10 32 9 and the chord *GD* 0 12 17 14 The corresponding arc of this is 11° 45′ 15″, the difference between the two latitudes

(17) The sum of the time units between these towns is 18° 5′ 58″, which is the difference between Baghdad and al-Iskandarīya The number of hours corresponding to this result is one hour and a fifth approximately

(18) It follows that Ghazna has a difference with regard to al-Iskandarīya of 42° 26′ time units, which corresponds to 2 49 44 hours In day minutes this is 7 4 20 And in this way has become known the position of the place for which our computation was executed

(19) *Question* What is this sixth part that is subtracted from the distances?

Answer The people of the profession approve of this without constraint It is known, indeed, that when the distance between two places is traversing even flats we do not need to subtract anything from it because the leaving of the straight direction is caused by obstacles which make it necessary to deviate, such as mountains, where the ascent and descent increase the distance Likewise precipices and water-courses whose passages lie aside from the road, so that one has to take a deviating direction to reach them. Further, sand plains or salt-marshes and mud swamps, which have to be rounded by circuitous roads, and mountain passes of which the windings have to be followed Further conditions connected with the commodity of the journey such as precautions against calamities or lack of sufficient supply of water and forage on the straight road, so that it is advisable to take a roundabout way in

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[1] Schoy 6° 49′ 34″
[2] L 0 6 40 54, Schoy 0 6 5 43
[3] Schoy 11° 20′ 56″
[4] Schoy 0 11 34 14
[5] B 0 5 57 12, L uncertain, Schoy 0 6 16 12

order to obtain it These things are of different importance as they present themselves separate or combined, so that the measure of the decrease is different and has to rely on the impressions and estimates of eye-witnesses So there are stretches which make necessary the decrease of one-half or more than that and others which make necessary the decrease of one-sixth or less All in all, one-sixth has been accepted by common consent for the road stretches which approach a straight line

(20) *Question* Can the longitudes be ascertained more correctly by the distances or by the eclipses?

Answer When one determines the distances so exactly that they approach straightness, the operation with them is superior to the operation with eclipses, because the first appearance and the end of the visibility of the eclipse, which are its most critical moments (اظهر اوقاته *azhar awqātihi*), can only be observed approximately For the contact of the circles of the shadow and the moon is generally preceded by a certain faintness, which gives the impression of smoke at the first appearance (of the eclipse), and likewise the same thing occurs after their separation at the end of the eclipse Then the roundness of the shadow becomes visible only after it has already taken a good deal from the moon, and in between these various moments a certain number of the time units of the celestial equator are turning round, which spoils the distance between the two latitudes, either by increasing it or by decreasing it And it may cause inexactitude in the observation when the two observers are not exactly in agreement on the identity of the situation which they both have in view, so one of them should not pursue one line and the other another [1]

(21) *Question* Why is it that Ghazna and al Iskandarīya have been specially chosen in this chapter as objects for the verification of the longitude?

Answer. As regards Ghazna, here has taken place my last observation of the sun As to al-Iskandarīya, the reason is that I am necessarily relying in the operation on the observation of Ptolemy for he was himself in that place And it so happened that Ghazna was the eastern end of the places where, according to the reports that have reached me the sun has been observed, while al-Iskandarīya was the western end Therefore I have indicated in a table the distances of the various places with regard to those two towns, in day minutes as well as in time units of the celestial equator, in order that it may be fit for use

[1] In Arabic the word *wādin* is used here idiomatically فلا يذهب احدهما الى واد والآخر الى آخر *falā yadhhab aḥaduhumā ilā wādin wa'l-ākhar ilā ākhar*

TABLE

Distance between Ghazna in the east and

Towns	Time units		Day minutes		
	d	m	m	s	tr
Balkh	3	20	0	33	20
Nisabur	9	20	1	33	20
al-Jurjāniya	10	13	1	42	10
Jurjan	14	6	2	21	0
Shiraz	15	46	2	37	40
al-Rayy	16	15	2	42	30
Baghdad	24	20	4	3	20
Surra man ra'a	24	35	4	5	50
al-Raqqa	30	41	5	6	50
Dimashq	34	20	5	43	20
al-Iskandariya	42	26	7	4	20

Distance between al-Iskandariya in the west and

Towns	Time units		Day minutes		
	d	m	m	s	tr
Dimashq	8	6	1	21	0
al-Raqqa	11	45	1	57	20
Surra man ra'a	17	55	2	58	30
Baghdad	18	6	3	1	0
al-Rayy	26	11	4	21	50
Shiraz	26	40	4	26	40
Jurjan	28	20	4	23	20
al-Jurjāniya	32	13	5	22	10
Nisabur	33	6	5	31	0
Balkh	39	6	6	31	0
Ghazna	42	26	7	4	20

Remarks on the text

(1) With the 'transfer of the time moments' al-Biruni seems to have in view the calculation of astronomic tables especially for Ghazna in order to give this town and the reigning Ghaznevids a scientific standing corresponding to its political importance, just as many princes had a geographical description of the world made to accentuate their political power. The same was done, for instance, by the astronomers of al-Ma'mūn, who composed the Ma'mūnic tables, by Ibn Yūnus for the caliph al-Ḥākim and by the astronomers of Alphonso the Wise in Toledo. Schoy has already pointed to this motive in his article quoted hereafter.

(2) In saying that the difference in longitude between Ghazna and Baghdad is 24° 20′ the author gives in advance the result of the following computation.

(3) The *yamīnī* ring must be a special variation of an observation instrument, where an index is running along the border of a ring or ring sector—as is also found in the astrolabe—and which was called in this case after Maḥmūd of Ghazna, whose honorific name was Yamīn al-Dawla. The description given of this instrument by al-Biruni in no way justifies the qualification by Schoy as an octant (Achtelring). The description does not imply, however, that there was only one mark for each set of eight minutes, it rather points to a decorative device in which each time eight minutes were singled out and which gave to the ring its special character, on which a

special surname was applicable. This must also have been the case for the other rings which are named in the text hereafter.

Al-Biruni's determination of the latitude of Ghazna is described at length in the eighth chapter of the fourth treatise of the *Qānūn*. This chapter was translated and commented upon by Schoy in his article *Die Bestimmung der geographischen Breite der Stadt Ghazna* in *Annalen der Hydrographie und Maritimen Meteorologie*, 53rd year, 1925, pp. 41–47. The exact result given here is $90°-56° 25' 42'' = 33° 34' 18''$. It is curious to observe that in this chapter the year of the observation is not mentioned; we only learn that it was done on Monday the 5th of the Persian month Ādharmāh 'in the year that is registered in the year indication for Ghazna'. Schoy supposes that the special observation referred to took place on the 19th of November 1019, which is not in disagreement with the statement of our text. Neither is the *yamīnī* ring mentioned in the description of this observation.

(4) It is not easy to control al-Biruni's statement that the distance between Baghdad and Shiraz is 170 farsakhs. The earlier geographers often describe this road or parts of it, giving the distance in day's journeys (مرحلة *marhala*), post stages (بريد سكة *sikka, barīd*) or farsakhs, but as none of these road measures is well defined, it is difficult to make a comparison with the figure given by the author. The shortest road between the two towns passes through Wāsit, Ahwāz and Arrajān, but it is not probable that al-Biruni has been himself in these parts, which can also be induced from his remark that this distance covers for the greater part flat country. This may be true as far as Ahwāz, but farther to the east there are formidable mountain passages, among them the gorge of Bawwān, celebrated as one of the most beautiful spots on the earth.[1] The most comprehensive description of the road is found in Ibn Khurradāhbeh, who counts 94 stages from Baghdad to Shiraz.[2] From Ahwāz to Shiraz there are 49 stages. Ibn Kh. gives this last distance also in farsakhs, the sum of which amounts to 88 farsakhs.[3] At this rate, the entire road, expressed in farsakhs, would be 169 f., which is remarkably near to the figure given in the text. The dates given by other geographers more or less agree with Ibn Kh.[4] We do not intend to subject the other distances given by al-Biruni to a detailed examination, but what has been said may be sufficient to show that

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[1] Ibn Khurr., p. 43, Maqdisi, pp. 420, 434, Ibn Hawqal, p. 199 (2nd ed. 282), etc.

[2] Cf. p. 42: Baghdad-Wāsit 25 stages, Wāsit-Ahwāz 20, Ahwāz-Arrajān 20, Arrajān-Nawbandajān 17, Nawbandajān-Shiraz 12.

[3] p. 43.

[4] *Vide* Ibn Rusta, p. 189: Ahwāz-Arrajān 24 f., Arrajān-Shiraz 61 f., Ibn al Faqih, p. 200: Arrajān-Nawbandajān 26 f. and p. 203: Nawbandajān-Shiraz 23 f.

he must have used his own method in arranging the distances reported to him. With al-Biruni the farsakh has indeed a fixed value, the circumference of the Earth being given by him as amounting to 6,800 farsakhs or 20,400 miles.[1]

The correction or straightening of the distances by dropping a certain fraction is more amply treated in para. 19.

In converting the distance expressed in farsakhs into degrees of the Earth circumference the author does not seem to be consistent. If the circumference is 6,800 f., there falls on one farsakh 190,58 seconds or 0° 3′ 10,58″. The 153 f. of the rectilinear distance between Baghdad and Shiraz would be 8° 5′ 58″, in giving 8° 6′ 0″ he may have been rounding off, but in some other cases to come he is much less correct.

(5) In this paragraph the theorem of Ptolemy is applied.

The method followed by al-Biruni in converting an arc into a chord is explained in the seventh chapter of the third treatise of the *Qānūn*. Schoy has translated this treatise and commented on it in his posthume book *Die trigonometrischen Lehren des persischen Astronomen Abū'l-Raihān Muh. ibn Ahmad al-Bīrūnī* (Hanover, 1927). After having given in Ch. 6 a table of the sines of the arcs from 0° 15′ till 90°—augmenting each time with 15′—the author explains in Ch. 7 how he finds the sines of arcs lying between those given in the table by interpolation. According to the table the sinus of 4° is 0 4 11 7 24 and of 4° 15′, 0 4 26 27 26 so that the chord of 8° 6′ must be between 0 8 22 14 48 and 0 8 52 54 52. We shall not try here to control the author's statements in detail, but we must point to the fact that in the sinus tables of Ulugh Beg, reproduced by Schoy at the end of his publication just mentioned, the sinus of 4° 3′ is 0 4 14 15 25 44, this would give for the chord of 8° 6′ the value of 0 8 28 30 51 28, which is not exactly the value given by al Biruni. The same small divergence can be observed in the other 'conversions' that appear in the text.

(6) In this paragraph the computation of the difference in latitude between Baghdad and Shiraz is brought to an end.

Al-Biruni does not say who is his authority for taking 33° 25′ as the latitude of Baghdad, but he is on this point in agreement with Ibn Yūnus, who died in 958 (MS. Leiden 1057). The older authorities, such as al-Battanī and al-Khuwarizmī, have 33° 20′ and this seems to go back on the observations executed under the caliph al-Ma'mūn at al-Shammāsīya in Baghdad.[2] At any rate the figure is not Ptolemaic.

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[1] So in the *Qānūn*, cf. Schoy, *Isis*, V, p. 71. Also in the *K. al-Tafhīm*, Teheran edition, 1316–1318, p. 156.

[2] Cf. Honigmann, *Die sieben Klimata*, Heidelberg 1929, p. 127.

Abū'l-Husain al-Sūfī (died 986)[1] lived under the Buyid dynasty and so it is not surprising that he gave to the 'ring' with which he operated the epithet of *'adudī* after the great Buyid ruler 'Adud al-Dawla (died 983).[2] Al-Knuwārizmī gives Shiraz the latitude of 32, likewise Ibn Yūnus.

In stating that the ratio between the chords *ZB* and *AH* is equal to that between the sines of *TB* and *TA* the author should have added that this is also the ratio between the cosines of *BD* and *AG*, because in the following he only speaks of these cosines. In any case the cosinus of the latitude of Baghdad (*AG*) is found by looking up in the sinus table the sinus of 90° − 33° 25′.

The text does not give the entire calculation which leads to the result that the difference in longitude between Baghdad and Shiraz is 8° 33′ 32″. Altogether there are 15 arithmetical operations involved, mostly executed in the laborious sexagesimal system. I have tried to make the calculations as indicated by Al-Birûni, but I have not come to the same result, although the difference is not considerable. In the following list of the operations I have put my own results between brackets.

1	Determining the distance between *A* and *B* (Baghdad and Shiraz)	153 f
2	Finding the equatorial degrees of 1	8° 6′ 0″
3	Converting 2 into a chord	0 8 28 32
4	Determining the difference in latitude between *A* and *B*	33° 25′ − 29° 26′ = (3° 59′)
5	Converting 4 into a chord	0 3 59 46
6	Squaring 3	(0 1 11 50 6 9 4)
7	Squaring 5	(0 0 11 58 8 3 16)
8	Subtracting 7 from 6	(0 0 59 51 58 5 48)
9	Finding the cosinus of lat *A*	0 50 3 12
10	Finding the cosinus of lat *B*	0 52 10 16
11	Multiplying 8 with 9	(0 0 49 56 30 19 7 54 33 36)
12	Dividing 11 by 10	(0 0 57 26 9 58 15)
13	Extracting the root of 12	0 7 28 27 (0 7 34 43)
14	Dividing 13 by 9[3]	0 8 57 16 (0 8 57 33)
15	Converting 14 into an arc of the equator	8° 33′ 32″

(7) The longitude of Baghdad (70°) agrees again with that given by Ibn Yūnus. It may have also been the longitude given by al Khuwārizmī according to Yāqūt who quotes the 'author of the *Zīj*' (I 678). The *K Sūrat al-Ard* by al-Khuwārizmī (ed von Mzik), however, has 73, which must be an error.[4] Al-Battānī's 80° is counted from a beginning point lying 10° farther to the west.

[1] Cf Brockelmann, *G A L*, Suppl I, 398.

[2] Schoy translates 'mit dem grossten Ringe'.

[3] My starting point is here the result given by Al-Birûni (0 7 28 27) and not my own.

[4] Cf Honigmann, op cit, p 127 note.

The real difference of longitude between Baghdad and Shiraz, according to modern observations, is 52° 40′ − 44° 24′ = 8° 16′

(8) Al-Birûni's correction of the sum of the given distances, which is 335 f, by subtracting 51 f seems rather arbitrary The 51 f are, however, between $\frac{1}{7}$ and $\frac{1}{8}$ of 335 It is possible that here he judges after his own experiences

(10) Here begins the computation of the longitudinal difference between Baghdad and Ghazna by following the northern road

For al-Harawī and al-Khujandī cf H Suter, *Die Mathematiker und Astronomen der Araber*, p 228 and p 74 (No 173)

(11) Al-Jurjānīya was Al-Birûni's birthplace, where he was able to make himself his astronomical observations The '*shāhī* ring' must have been named after the title of Khwārizm-Shāh, which the rulers of that country continued to bear [1]

(12) The text implies that al-Biruni had already made up his mind about the rectilinear distance between the two towns He must have been well acquainted with the regions traversed [2] and has no doubt taken into account the mountain ranges in northern Afghanistan Schoy is not very clear in the rendering of this passage

(13) The real difference in longitude between Baghdad and Ghazna is 23° 54′ The corrections applied by the author seem to have been too small

(14) I have not found Al-Birûni's quotation in the Greek Almagest According to Ptolemy's Geography (ed Nobbe, I, 251 and II 72) the difference in longitude between Babylonia and Alexandria is 79° − 60° 30′ = 18° 30′, while $\frac{1}{2}+\frac{1}{3}$ hour would mean 12° 30′ As for the latitude Ptolemy's Geography gives 32° Al-Khuwārizmī has 31° 5′ and Ibn Yunus 31° H von Mžik, who has commented upon al-Khuwārizmi, considers these latitudes as not Ptolemaic [3] So al-Biruni's authority remains obscure In para 21 he expresses his full confidence in Ptolemy's latitude

(15) For al-Hāshimī, who died in 187 cf Suter page 79 and Brockelmann, *G A L* Suppl I 386 The year of al-Hāshimī's observation seems to have been left out on purpose The same reticence about a date is shown in Al Birûni's report on his observation of the latitude of Ghazna (see my remarks on para 3)

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[1] Schoy's translation 'mit dem scharfsichtigen? Ring' is far beside the mark

[2] That an intelligent traveller may be able to compute distances to a certain degree of exactitude is confirmed by Doughty, *Travels in Arabia Deserta*, London and Toronto, 1930, p 15 'Afterward when even my watch failed, I have computed distances in Arabia by camel journeys, nor is this manner so rude that the situation of any place in so vast a country may not be found by diligent cross reckoning, with the largest error, I suppose, of thirty miles '

[3] *Denkschriften K Ak Wiss Wien, Phil Hist. Klasse* Vol 59 4, p 19

It is not surprising that the author shows full confidence in the famous al-Battānī, who made his observations in al-Raqqa and died in 929

(16) For this paragraph I am able to produce a parallel text from al-Bīrūnī, which is found in his work تحديد نهايات الاماكن لتصحيح مسافات المساكن (*Tahdīd nihāyāt al-amākin li-tashīh masāfāt al-masākin*)

Only one MS is known, which is in the Fatih Library at Istanbul (No 3386)[1] It was finished in Ghazna on the 23rd Rajab 416 (19 Sept 1025), and so, if not an autograph, written under the author's personal supervision The text deals just with such geographical-mathematical subjects as are treated in the chapter discussed in this article and contains, besides, some important geographical items

In his article *Der Islam und die geographische Wissenschaft* in *Geographische Zeitschrift*, XLth year, 1934 (pp 361-372), Ahmet Zeki Validi gives the German translation of a passage in the middle of the MS (foll 123*b*-124*b*), where Al-Bīrûnī speaks of his desire to determine especially the position of Ghazna on the surface of the earth He expresses his doubt as to the reliability of Ptolemy, not on account of lack of accuracy of this author but because Ptolemy had to rely for a good deal on uncertain reports from far-away countries Now that the dominion of Islam has facilitated communications over a considerable part of the globe, the exact determination of geographical positions is possible on a much wider scale Al-Bīrûnī has here in view a combination of descriptive and mathematical geography In an earlier part of the same work (fol 8*a*) he says 'In the foregoing time I have been intended on combining the methods in the book *Jughrāfiyā* and al-Jaihānī and other authors of road books ' Unfortunately this combination has never been harmonically realized in Islamic geographical lore

The latter half of the book is entirely given to the computation of longitudinal distances It gives the calculations much more in detail and deals with towns such as Balkh and Nisabur, which are not mentioned in the *Qānūn* text, though they are found in the table of longitudes at the end of para 21 Apparently the *Tahdīd* was written before the *Qānūn* and so the chapter discussed in the present article is only a compendium This is not contradicted by the fact that the oldest extant copy of the *Qānūn* was finished in exactly the same year as the MS of the *Tahdīd*, namely, in the year 416/1025[2] It would only seem that al-Bīrūnī had some carefully written copies of these treatises executed in the said year

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[1] Cf. Brockelmann, *G A L*, Supp I, 874

[2] Istanbul, Fatih No. 3286, cf. *G A L*, Supp I, 873

I happen to possess photographs of the last pages of the *Tahdīd* MS of Istanbul As it is very beautifully and clearly written, we may presume that it is as good a text as we can desire On foll 166*b*–167*a* we find the following account of the computation of the longitudinal difference between al-Raqqa and al-Iskandarīya

'As regards the difference in longitude between al-Raqqa and al Iskandarīya, we remark that the difference in latitude between both places is 5° 3', of which the chord is 5 17 12,[1] the square of which is 27 56 55 50 24 The distance between them by way of Hims, Dimashq, Tabariya, al-Ramla and Misr (Cairo), though this is not a straight stretch, is 750* miles[2] approximately From al-Raqqa to Hims this is 154, then to Dimashq 56, then to Tabarīya 66, then to al-Ramla 87, then to Fustāt Misr 297, then to al-Iskandarīya 80 Now if we discount one sixth from the number of these miles the result is 628*, which is in parts 11° 15' 56" the chord of which is 11 35 14 The square of this is 132* 39 33 8 16, and the difference between the two squares 104* 42 37 17 52 This we multiply with the cosinus of the latitude of al-Iskandarīya, which is 51 26 58, the product is 5387* 8 39 59 53 18 56 We divide it by the cosinus of the latitude of al-Raqqa, the result of which is 111* 0 17 27 49 The root of this is 10 32 9 This we multiply with the entire sinus (sin 90° or 1 radial) and obtain 632* 9 0 Then we divide this by the cosinus of the latitude of al-Iskandarīya, of which the result is 12 17 14 And this is the chord of the arc 11° 45' 15", the longitudinal distance between al-Iskandarīya and al-Raqqa '

The author goes on by stating that this result is very near to that of al-Battānī and this increases his confidence in the *Zīj* of that author

The passage of the *Tahdīd* contains the entire computation, while the *Qānūn* passage only gives an extract The only item missing is the indication of the cosinus of the latitude of al-Raqqa We find all the 15 arithmetical operations mentioned above, he only adds after operation 13 the multiplication of the value found for *AH* with the 'entire sinus', namely with 1 This only implies another way of writing 632* 9 0 instead of 10 32 9

It is disconcerting to state, however, that even here the results of some calculations do not hold good if we try to execute them ourselves The sum of the distances given is not 750 but 740 miles[3]

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[1] In this text the figure for the radials— which is always 0—is omitted everywhere, so that the first figure of the value renders the radial minutes, the second the seconds, etc

[2] The figures marked in this translation with an asterisk are written with 'Indian ciphers' in the text, the others with Arabic letters

[3] The mile is the Western measure as against the Eastern farsakh For Al-Bīrūnī 1 mile is always ⅓ of a farsakh

and $\frac{5}{8}$ of this amount is not 628 miles, the same figure that is given in the *Qānūn* Further the squaring of 11 35 14 (operation 6) does not give 132 39 33 8 16 but 134 15 49 23 16 Still he uses this wrong result in the subtraction from the other square, which happens to be right Operations 11, 12 and 14 again do not hold good, though the difference is never considerable

How do we account for this? Probably al-Biruni did not do all the ciphering himself and had to rely on a staff of calculators which worked for him Even the great authenticity of the *Tahdīd* MS would then not be a guarantee for a faultless rendering of the application of the great mathematician's theory Still the results of the computation do not seem to be worthless, as the deviations from the true situation are only slight

(17) In the table at the end of para 21 the longitudinal difference between al-Iskandarīya and Baghdad is rounded off to 18° 6′ In the great table of longitudes and latitudes found elsewhere in the *Qānūn* the longitude of al-Iskandarīya is given as 52°, implying a more extensive rounding off

(18) A day minute is the 60th part of a day and corresponds to 6°

(19) In this paragraph is shown the essential practical weakness of al Birûni's admirable construction The author refers to the 'people of the profession', but it would seem that this is only an excuse for his own way of dealing with the distances We have seen already that his corrections are very subjective Still, because they are Al-Birûni's, we cannot consider them as worthless

(20) This paragraph has been misunderstood by Schoy He thought that the text spoke about two shadow circles, which has brought about confusion in his translation The reasoning of al-Biruni is remarkably clear He only seems too optimistic about the possibility of determining the rectilinear distance between two places

(21) Though Baghdad is no more mentioned in this paragraph, we have seen that this city remained for Al-Birûni's age the pivot on which all things in mathematical geography were turning It is not a mere coincidence that Baghdad was given a convenient longitude, marked by a round figure (70°) in the time of al-Ma'mūn

Al-Birûni himself made Ghazna a starting point for his computation of the longitudes of Indian towns and the far-away eastern and north-eastern countries that are recorded in his great table of longitudes and latitudes in the *Qānūn* The material with which he worked were the road distances that were brought to his knowledge by traders and envoys from distant countries Professor Minorsky has rightly considered the geographical indications of the *Qānūn* important enough to use them in his book on Marvazi for a calcula-

tion of the distances by a method which is exactly the reverse of the intricate calculations of Al-Bîrûnî [1]

The small table of longitudes at the end of the chapter contains, as we have said, also the towns which were more extensively dealt with in the *K al-Tahdīd* The figures given are not faultless, especially in the column of the day minutes, which gives not always exactly the sixth part of the degrees of the first column I have reproduced the table after the manuscripts, as Schoy has done also, without making the corrections that would be possible

The foregoing remarks may have given a glimpse of the very laborious kitchen-work that was done by Al-Bîrûnî, or rather for him, in the elaboration of the remarkable results attained by him The inconsistency in the calculations must perhaps not be attributed to the great scholar himself, but should be seen as springing from the necessity in which he found himself to exploit his huge mass of material

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1 Cf *Sharaf al-Zaman Tahir Marvazi* by V Minorsky, London, 1942, p 69

BĒRŪNĪ AND THE MS. SULTAN FĀTIH No 3386.

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BĒRŪNĪ

Abu-r-Raihān Muhammad b Ahmad in the introduction of what is probably his last work, the *Kitāb as-Saidana*, speaks about the inadequacy of the Arabic script to render exactly the phonetical values of sounds, particularly of vowels in foreign languages He was speaking of the difficulty in identifying the names of drugs and plants that were known by their Greek or Syrian names transcribed in Arabic letters The late Dr Max Meyerhof edited this introduction with a German translation in 1932, but the small volume, published at a ridiculously high price (M 7·80 for 18 pages of Arabic text and 52 pages of translation) may not be accessible to most readers and I give here an English translation of it, after having again compared the photos of the original manuscript He says

'In accordance with my natural disposition I was from my youth possessed with a real greed to acquire knowledge, considering my age and the existing circumstances As an example may suffice that a Roman (Greek) lived in our country and I used to go to him with grains, seeds, fruits, plants and other articles and ask him about their names in his language and put them down in (Arabic) writing However the Arabic script has an immense defect, namely the similarity of the shapes of the letters and that you are compelled to use dots and vowel-points to distinguish them For if they are omitted the meaning becomes doubtful Added to this comes the neglect to check and compare the text copied to see that it is correct As this (the neglect) is habitual with our people it does hardly matter whether the book (so written) exists or not, or whether its contents are known or not known

'If it were not for this defect it would be sufficient to have what is in the books of Dioscurides, Galenos, Paulos and Oraibasios in which the Greek names are transcribed in Arabic letters, but we cannot trust them, nor are we certain that they have not been altered in copying

'Current among the public is in use a book called *Dah-nāmah* in incorrect copies of no real value and it has a misleading title, for the equivalents in ten languages are not given for every word mentioned in it The Christians have a book called *Pushshaq Shamahe*

(i.e. Commentary of Names of Syriac) which is also known by the title *Chahār Nāmah* because each word is given in Greek, Syriac, Arabic and Persian. I acquired a copy of it in the Syrian script and in it are none of the defects which lead to misunderstanding and for this reason I have copied most of its contents (into Arabic script). They also have books called *Lexicons* which give uncommon words with an explanation of their meaning as they were difficult to understand. Sometimes these books are composed for certain works. I possess a lexicon for the *Zīj* of Ptolemy, the text of which is in Syriac, then exactly in Arabic, then the explanation; to this book I refer in my researches. I also acquired the following two books *The Book of Herbs*, very useful with pictures, and the *Kunāsh* of Oraibasios in which against all medicaments the names are written in Greek letters and I copied them because I had confidence in them.'

So far this introduction to support to a measure my claim that the *Nisba* of Abu-r-Raihān should be pronounced BĒRŪNĪ with a long E and not Bīrūnī as indicated in some sources like the *Ansāb Sam'ānī* (who certainly knew better but could not express it in Arabic letters). In the autograph manuscript (Istanbul, Fātih 3386) of which I published a facsimile in 'Islamic Culture' the author himself, who should know his own name, has clearly vocalized the *Bā'* with a fath, which would mean a pronunciation Bairūnī, but in the fifth century of the Hijra no special mark was used to indicate consonants peculiar to Persian or other languages and not found in the Arabic script. If the *Nisba* referred to a suburb of Gurgānj, where Abu-r-Raihān was born and lived, and it was indicated by the word, there it certainly was pronounced in the language of that time. We are taught in Persian dictionaries of much later times that the word meaning 'outside' was pronounced with *Yā'i Majhūl* 'BĒRŪN', a pronunciation which has survived to this day in India.

THE MS. SULTAN FĀTIH No. 3386

The manuscript, besides being an autograph written by Bērūnī in Ghazna, is important from another point of view. It shows us the author as an enquirer into the geography of the lands which came under his notice. I had for a short time at my disposal photographs, which Professor Ritter had taken for the State Library in Berlin, but unfortunately could copy only the first 54 pages. However, as the original may not be available for a long time and the Berlin photographs may have been lost, some extracts and translation may be of some service. The title reads:

كتاب ..... ى تحديد نهايات الاماكن و تصحيح مسافات المساكن

and the purpose of the work is to enable scientists to ascertain the correct longitudes and latitudes so essential for fixing the correct direction of the Qibla, because Bērūnī had found that much nonsense had been said such as the sun being at its zenith everywhere at the same time

As my sole aim is to draw attention to this work which should be published I give some extracts from a rather long introduction in which Bērūnī insists upon the importance of geographical knowledge

(1) (p 11) 'One day in an assembly there happened to be a man learned in lexicography when the book "The Routes and Kingdoms" (*al-Masālik wal Mamālik*) was mentioned and he went beyond bounds in deprecating it, almost placing it outside the pale of sciences, and in his talk he insisted that it was of minor importance and that there was no great advantage in knowing the distances between various kingdoms I was amazed about him, but why wonder? The likes of people vary greatly and the intentions differ considerably, so that really as it is often said, there is no scope for arguing though some put in a nicer manner than others in giving expression There is no difference between him and many people of our times who give preference to the Persian language before the Arabic who will say What is the advantage of the inflection of the nominative for the subject and the accusative for the object and other specialities of the language

(2) 'But does not the Holy Writ speak of the travels of saints, satisfied with them, like Dhu'l-Qarnain reaching the rising and setting of the sun, Moses coming to the Meeting of the Seas and the Night Journey of the Prophet, whom God bless, from the Sacred Mosque to the Distant Mosque and his emigration from Mecca to al-Medina besides his travels on warlike expeditions while those who stayed behind were reproached

As an example of persons who know the roads of reaching a country differing from those who are ignorant he quotes the following tale

(3) 'At a time not far distant from ours there was among the pilots of Sīrāf learned in the routes across the sea one named Māfannā One of the captains hired him for a big fee to pilot him to China When they came to the gates (which are rivers flowing down to the sea between high mountains, the wind prevented him from slipping through the gates which lead to Khānfū (the modern Canton), which is the first harbour of China to be reached and which the captain was aiming for So Māfannā made for a gate which led to another harbour, but the owner of the ship asked to stear again for the high sea and try to aim for the gate of Khānfū Māfannā warned him of the dangers of the sea after he had escaped from them, but the captain refused (to listen) So the ship was steared again

into the Ocean and a storm arose and wrecked the ship Māfannā threw himself on a plank of wood which floated with him and he remained on the waters for three days and nights when a sailing ship (Junk) came into sight which was sailing from Java to China and had missed its course He waved to them and they took him on board on account of his reputation and they thought themselves lucky They asked him for advice upon which he demanded his fee At this the master of the ship became angry saying "Are you not satisfied at being rescued but must ask from us a fee when you only share with us in having your life saved?" He replied "I shall never guide you unless you give me money, dying or reaching China are the same to me in my condition (without money)" The master of the ship said "If you will not guide us I will put you back into the sea as you were" He replied "Please yourself" So they cast him back into the sea on the same plank and they sailed on and strayed till they perished Māfannā remained in the sea two more days when another sailing-ship passed which had lost its course They asked him what had happened to him and what his aim was if they took him on board He replied that he required a fee, otherwise they could put him back into the sea So they gave him 200 *mithqal* of gold and he took the rudder of the vessel, cast out the plumb-line (which is a heavy piece of lead with which the depth of the sea and the eminences at the bottom of it are sounded) He brought up the clay from the bottom, smelled it till he made sure of the place where he was, steered the right course with them and reached safety '

(4) (p 19) 'In the days gone by I had the intention to collect the information by Ptolomaios in the book GEOGRAPHAIA and by al-Jaihānī and others in books on travelling-routes which were scattered in these books and to make easier what was obscure so as to perfect this science I therefore first corrected the distances given as well as the names of places and countries from what I had heard from the mouth of these who had travelled those roads and gathered from those who had been there, after making sure and using caution in accepting the witness of one against the other I was not niggardly with my money and reputation to gain what I required to know I made for this purpose half a globe, the diametre of which was ten yards, traced upon it the longitudes and latitudes from the route-indications when time was lacking to work out the mathematical account on them because of their multitude and length I used to rely for what I ascertained upon my putting it down in writing instead of trusting to my memory as I was not sure of (my) safety and as a guard against any accidents Then when trials came upon me unexpectedly, I remembered my strivings upon it in the past as if they had never been and if God make it

easy for me to have it back (and He has the power) I am not weighed down that I may complete it '

Then follow some philosophical discussions upon the age of the Earth which he estimates at millions of years The Qur'an (he says) does not enter upon this question at all, but the books of the Christians, Jews and Sabians speak of the first human beings , on this, however, they differ widely He translates the first verses of Genesis quite correctly and then he discusses the geological composition of the Earth and has observed that on some mountains the strata appear to have been dislodged by internal upheavals and that the surface of the Earth has undergone great changes

(5) (p 24) 'Abu'l-Abbās al-Erān**sh**ahri mentions that at a castle called *al-Baidā'*, a parasang from as-Sīrajān, a town in Kirmān, he saw the stems of date-palms which used to grow there, but the climate grew colder and the palms died and whithered and at his time there were no palms within the circumference of twenty parasangs A further proof is found in the fact that when the level of the ground rose, the brooks and rivers which had been flowing in earlier times dried up

In a similar way, sea has turned into land and land into sea , which changes, if they happened before the existence of man, are not known and if they took place later they are not remembered because with the length of time the record of events breaks off especially if this happens gradually This only a few can realize

This steppe of Arabia was at one time sea, then was upturned so that the traces are still visible when wells or ponds are dug , for they begin with layers of dust, sand and pebbles, then there are found in the soil shells, glass and bones which cannot possibly be said to have been buried there on purpose Nay even stones are brought up in which are embedded shells, cowries and what is called 'fish-ears', sometimes well-preserved or the hollows are there of their shape while the animal has decayed The same are found at the Bāb al-Abwāb on the shores of the Caspian Sea But there is no memory of a known time nor any history about it for the Arabs have inhabited the land since their ancestor Yoqtān Of course, they may have lived in the mountains of Yaman while the low-land was sea. These were the 'Arab al-'Āriba of antiquity They cultivated the land from a spring between two mountains the waters rising to the top, and two gardens flourished right and left till the dam break of al-'Arim ruined them because the water sank and cultivation ceased and in place of the two gardens there were two waste lands with bitter herbs, tamarisks and a few willows

We find similar stones in the centre of which are enclosed 'fish-ears' in the sandy desert between Jurjān and **Kh**wārazm which must have been a lake in the past, because the river Jaihūn (Oxus), I mean the river of Bal**kh**, ran through them to the Caspian Sea past

a district known as Balkhān. Thus Ptolomaios mentions in the book GEOGRAPHAIA that the river flows into the sea of Hyrcania, i.e. Jurjān. Now between to-day and the time of Ptolomaios are nearly eight hundred years. The Oxus used to flow in those days through those plains which to-day are desert from a place between Zam and Āmūya and irrigate the lands and villages which were there round Balkhān and shed into the sea between Jurjān and al-Khazar. Then happened some silting which diverted the waters to the land of the Ghuzz Turks, where its course was interrupted by a mountain known to-day by the name of *fam'al-Asad* (the lion's mouth) and among the people of Khwārazm as *Sikr ash-Shaitān* (*Devil's Dam*). There the water accumulated and rose so that the traces of the dashing of the waves are on the heights thereof. Then when the weight (of the water) and the pressure on those porous stones became excessive, it broke through and burrowed about one day's journey, then turned to the right towards Fārāb on a course known to-day as *al-Fahmī*. The people cultivated the land on both sides of its banks in about three hundred towns and villages, the ruins of which are remaining to this day. Then happened to this water-course after a lapse of time what happened to the first and the water turned to the left to the land of the Pajnākis and took the water-course known as Wādī Mazdubast in the desert between Khwārizm and Jurjan and irrigated numerous localities for a long time till they too fell into decay. So the inhabitants moved to the coast of the Caspian Sea. They are folk of the kind of the Allān and al-Uss and their language to-day is a mixture of Khwārazmī and Pajnākī. After this all the water flowed towards Khwārazm after seepings had flown there before and it purified itself at a place barred by rocks, which to-day is at the beginning of the plain of Khwārazm, and burst through it overflowing the district and making a small lake and on account of its abundance of water and the strong current it became muddy from the clay the water carried. This used to sink as the water spread with the mud it carried and harden gradually where it broke through and became dry and the lake moved further till it surrounded all Khwārazm and the lake reached the sand-dune which lay across its course and as it was not able to press it further it turned towards the north to the land inhabited by the Turkumān to-day. Between this lake and that which was in the Wādī Mazdubast is no great distance. It has become a muddy salt-swamp which cannot be forded and is known in Turkish as *Khīz-Tanqizi*, i.e. the Maiden's Sea.

(6) 'Ibn al-'Amīd in the BOOK ON THE BUILDING OF TOWNS states that an earthquake occurred in ar-Rūyān at a time not long ago and upset two mountains so that they banged together and hindered the course of the rivers which used to flow between them by blocking the passage. So the water was kept back and formed a

lake In the same way, as it found no outlet, is the lake of the Dead Sea which has its origin from the accumulated waters of the Jordan

From the history of the Syrians I have copied that in the year 838 of Alexander, which was the second year of the reign of Justinianus Caesar, there was an earthquake and upheaval at Antioch (Antākiya) and that a mountain above Clodia split in two and fell into the river Euphrates and blocked it Then the water rose till it drowned and ruined (various places) and the water accumulated till it opened itself a place and flowed again

This country, Egypt, had the Nile spread over it, as Aristotle mentions in his book *al-Āthār al-'Ulwiya* and covered it like a sea Then the water continued to sink in and the land which was above dried gradually and was inhabited till it became filled with towns and people, but to-day the commencement of its cultivation is not known Egypt used to be called Thēoa after the name of one of its towns in Upper Egypt which was the part first settled and this town is different from its large town called Memphis which is the same as Manf, and Homer the poet, who is modern in comparison with the ancient Egyptians, calls her in his poem Thēba At the time when Egypt was (partially) sea a certain king in one of his occupations of the country was anxious that they should dig to it from Qulzum (the Red Sea) and raise the Isthmus above the two seas so that it would be possible for a ship to sail from the Ocean in the West to the one in the East The first to do this was Sesostrates, then Darius and they dug a considerable distance, which (channel) is existing to this day, the water of the Red Sea entering with the flow and receeding with the ebb Then when they measured the level of the water of the Red Sea they gave up what they intended fearing that (the water of) the Red Sea might deteriorate the water of the river of Egypt, being of a higher level Later Ptolomaios the Third completed it by the efforts of Archimedes as he attained his purpose without causing any harm Later the kings of the Romans filled it up to hinder the Persians from coming to Egypt '

(7) 'The desert known by the name *Karkas Kūh* between Fārs and Sijistān and Khorāsān is full of ruins of decayed settlements which Ptolomy calls Qarmania the Deserted, i e Kirmān the Deserted The Persians say that it used to be the most cultivated province being watered by a thousand large springs, the water of which used to flow from the neighbourhood of Sijistān and that Afrāsiāb, the Turk, caused the waters to disappear and with the water being cut off those districts became deserted and what remained of those waters flowed to the lake Zarah which did not exist before.

One can witness in the districts of Syria and other places which lack water, plants and animals, ancient traces which necessarily speak of their having been inhabited at one time and this was possible only because there was water which failed later So are

the traces of cultivation in the swamps of al-Basra, for the Tigris used to flow through another course, then burst its banks to those places and overflowed them '

(8) 'Abul-'Abbās al-Ērānshahrī relates that at al-Busht in the district of Nīshāpūr a pipe-line was dug out and at the depth of some fifty yards were found the stems of three acacia-trees, which had been sawed with a saw Now it is well known that between the time when they were cut on the surface of the earth and were buried according to the measure mentioned the time cannot be fixed how long they must have been buried Also you cannot wonder at the preservation of the wood as neither heat nor cold could touch them with the change of the seasons and this made them last longer (in their original condition) '

(9) 'Also that piece of wood in Jurjān which rises each year from a spring, its roots growing in it and turning on the edge of the spring about which the people of Jurjān tell many silly tales and make much about it Yet it is only a willow affected by an earthquake, the ground splitting, the tree slipped into it Then the earth closed round it and the gap became the place of a spring which was not able to lift the tree (completely) , the branches whithered and fell off, but when in spring the waters in the interior increase, they lift the trunk so that it appears above the surface, but roots remaining hinder it from being ejected completely from the spring Those who dived into the spring and touched it found it to be like the top of an oven It remains above ground the days of the flowing (of the spring) but when the water returns to its usual level the wood returns to its resting-place The people of that district have no knowledge about the time when it first commenced, but it is well known that cultivation moves with the moving of (the supply) of water as it depends upon it '

Then follows an investigation concerning the creation of land and sea based on Aristotle with quotations from the Genesis and the Qur'ān the translation of which would take too much space and would require a long commentary for against his own intellect Berūnī cannot get away from the erroneous statements of his Greek authority While it is for him comparatively easy to ascertain the latitudes the difficulty (only solved in modern times with instruments not invented in his time) of ascertaining the longitudes was almost unsurmountable He will establish them with observations of the position of the sun, the fixed stars and the planets and this is the main part of the work which begins on p 45 of the manuscript I was able only to copy a few pages and to follow his arguments would require the knowledge of a first-class mathematician, which I am not, and my aim in this short article is to draw attention of competent scholars to the importance of this work, which shows us Berūnī as one of the foremost geographers of Islam.

Arabic Texts Translated

قد كان حمعى و أحد ادباء اللغة محلس حرى فه دكر كتاب المسالك و الممالك فأصرط الاديب المدكور من الوصع عنه حتى كاد يحرحه من حملة المعارف و اعتمد فى كلامه حديث المقعة و ان لاطائل للاحاطة بكمية المسافات بين الممالك فعحست منه و لا عحب فالسهوات محتلفة و الارادات متباينة و لس فيها على ما قيل حصومة الا ان تقييدها سحص دون آحر احسن من اطلاقها فلا فرق بينه و بين من تقابله من اهل زماننا الذين اثروا الفارسية على العربية فيقول له ما منفعة ارتفاع الفاعل و انتصاب المفعول به و سائر ما عندك من علل و عرائب اللغة *

ثم ما يحكيه سبحانه من اسمار أوليائه راضيا بها منهم كبلوغ ذى القرنين مطلع الشمس و مغربها و بلوغ موسى عليه السلام مجمع البحرين و اسراء النبى صلى الله عليه و سلم من المسجد الحرام الى المسجد الاقصى و هجرته من مكة الى المدينة و اسفاره فى غزواته و ما اقترن بها من ذم القاعدين عنه *

و لقد كان بالقرب من زماننا فى ربانية سيراف دليل عالم بطرق البحر يسمى ما فنا استأجره بعض البواجده بمال كثير الى الصين فلما قرب من ابوابها و هى الاودية التى تنصب الى البحر بين شواهقها حالت الريح بينه و بين ولوج الباب المفضى الى خانفو و هو اول بلاد الصين و كان مقصده يتعلق بما فيا باب آخر موذ الى غير بلد خانفو و سأله صاحب المركب ان يرده الى البحر و يقصد به باب خانفو فحذره ما فيا حوادث البحر بعد أن سلم منها فأبى الا حدا و امتد المركب الى اللجة فعصفت عليه ريح اهلكته و طرح ما فنا نفسه على خشبة طفت به و بقى فى البحر ثلاثة ايام بلياليها الى ان احتاز به من الرابع الى الصين سوق قد ضل طريقه فلوح لهم ما فنا و احملوه لسهرته و استبشروا بمكانه و سألوه الارشاد فطلب عليه أجره و غضب صاحب السوق و قال له · اما يقنعك تخليصنا روحك حتى تطالبنا بالاجرة و انت شريكنا فى السلامة ـ فقال: ما كنت لارشدكم او تعطونى مالاً فالموت عندى و دخولى الصين بهذه الحالة سواء ـ قال صاحب السوق · لئن ترشدنى لأعيدنك الى حالك ـ قال: شأنك ـ فقذفوه على

تلك الخشبة و ساروا و استمر بهم التحيّر حتى هلكوا ـ و بقى ما فيها فى البحر يومين حتى اجتاز به سنبوق آخر ضال فاستخرجوه خبره و عزمه فيهم حين اخبر بأمره فقال: طلب الاجره و الا فردّوني الى اللجة ـ فاعطوه مائتى مثقال ذهب و اخذ سكان المركب بيده و طرح البرد و هو اصاصه ثقيلة يُسبَر بها مقدار العمق و بتو الحبال فى القعر و استخرج طين القرار و شمّه حتى تحقق الموضع و عدل بهم الى الطريق فسلم *

و لقد كنت عازما فيها مضى على الجمع بين طريقى بطلميوس فى كتاب جاوغرافيا و الجيهانى و غيره فى كتب المسالك جمعا للتفرق و تسهيلا للمغلق كمالاً للفن فقدمت تصحيح المسافات و اسامى المواضع و البلدان سماعاً ممن سلكها و التقاطاً من فى من شاهدها بعد الاستيثاق و الاحتياط باستشهاد بعض على بعض و لم أضِن على مرغوب فيه من مال و جاه بحسب حصول هذا المقصود و عملت لها نصف كرة قطرها عشرة اذرع لاستخراج الاطوال و العروض من المسافات بها اذ الزمان يضيق عن استعمال الحساب فيها على كثرتها و طوله لكنى كنت اعتمد فيها كنت احصل على الضبط بالكتابة دون الحفظ اغتراراً بالسلامة و امناً من الحوادث ـ فحين عافصتنى النكبة اتت علىّ ذكرت فى جملة ما اتت عليه من اجتهاداتى و صرت كأن لم تغن بالأمس و ان سهل الله الاعاده و هو عليها قدير فلست بمتثاقل عن اتمام ذلك *

و قد ذكر ابو العباس الايرانشهرى انه شاهد بقلعة تعرف بالبيضاء على فرسخ من السيرجان من مدن كرمان اصول نخيل قد كانت بها فصرد الموضع و ذهبت نخيله و حمت و لم يكن فى ذلك الوقت حوله بعشرين فرسخا نخل و زاد الامر بيانا انه لما علا الموضع غار حواليه قُنى و انهار كانت تجرى من قبل ـ على مثله ينقل البحر الى البر و البر الى البحر فى ازمنة ان كانت قبل كون الناس فى العلم فغير معلومة و ان كانت بعده فغير محفوظة لأن الاخبار تنقطع اذا طال عليها الامد و خاصة فى الاشياء الكائنة جزواً بعد جزو و بحيث لا تفطن لها الاّ الخواصّ ـ فهذه بادية العرب و قد كانت بحرا فانكبس حتى ان آثار ذلك ظاهره عند حفر الآبار و الحياض بها فانها تبدى اطباقا من

تراب و رمال و رصراص ثم يوحد فيها من الخرف و الزحاج و العظام ما يمتنع ان يحمل على دفن قاصد اياها هناك دل يخرج منها احجار اذا كسُرت كانت مشتملة على اصداف و ودع و ما يسمى آذان السمك إما باقية فيها على حالها و إما بالية قد تلاشت و بقى مكانها خلاء متشكلا نشكلها ـ كما يوحد مثله بباب الابواب على ساحل بحر الخزر ثم لايذكر لذلك وقت معلوم و لا تاريخ السنة فان العرب قاطبة منذ اولهم يقطان على انه يمكن ان يكون سكناهم حبال اليمن وقت كون البادية بحرا فهم العرب العاربة الاقدمون و لهم كانت العمارة بها من شاذروان بين جبلين يرتفع الماء الى قُلّتيهما و يعمر جنتين عن يمين و شمال الى ان غال به سيل العرم فسفل الماء و بطلت العمارة و ابدلت بالجنتين أخر بين ذواتى اكل خمط و اثل و شئ من سدر قليل ـ و نحن نجد مثل هذه الحجارة التي يتوسطها آذان السمك في المفازة الرملية التي بين جرجان و خوارزم فقد كانت كالبحيرة فيها مضى لأن مجرى جيحون اعنى نهر بلخ كان عليها الى بحر الخزر على بلد يعرف بلخان و هكذى يذكر بطلميوس مصنفه في كتاب جاوغرافيا انه الى بحر ارقانيا اى جرجان و بيننا الآن و بين بطلميوس قريب من ثمان مائة سنة ـ و كان جيحون حينئذ يخترق هذه المواضع [الاصل هذا الموضع] التى هى الآن مفازة من موضع هو بين زم و بين آمويه فيعمر البلاد و القرى التى بها الى لدن بلخان و ينصب الى البحر بين جرجان و الخزر فانبثق له من الانسداد ما مال له ماؤه الى نواحي ارض الغُزية و اعترض له جبل يعرف الآن بفم الاسد و عند اهل خوارزم بسكر السطان فاجتمع وطما بحيث آثار تلاطم الامواج باقية على علاوته فلما جاوز حد الثقل و الاعتماد على تلك الاحجار المتخلخلة خرقها و اخترقها قريبا من مرحلة ثم مال يمنة نحو فاراب على مجرى يعرف الآن بالعجمى فعمر الناس على سطّيه اكثر ثلاث مائة مدينة و قرية باقية الاطلال حتى الآن و عرض لذلك المجرى بعد برهة ما عرض للاول فانسدّ و مال الماءُ ذات اليسار الى ارض البجناكية في مجرى يعرف بوادى مزدُبست في المفازة التي بين خوارزم و جرجان فعمر بقاعا كثيرة زمنا ممددا و خرب ايضاً فانتقل سكانها الى ساحل بحر الخزر و هم جنس اللانّ و الاس و لغتهم الآن مركبة من الخوارزمية و البجناكية ـ ثم جرى الماء كله نحو

خوارزم بعد ان كانت صاباته سيل اليها و تتصفى من خلال موضع مسدّ بالصخور هو الآن فى اوائل سهل خوارزم و خرقها و غرق المعة و صيّرها بحيره من لدن هناك و لكثره المياه و شده جريها تكدر بما يحمل من الطين فكان برسب عند الانساط ما معه من التراب و يغلظ الارض عند المصبّ اولا فأولا و يظهر يبسا و يبعد البحيره الى ان طهرت خوارزم بأسرها و بلغت البحيره فى التباعد الى جبل معترض امامها لم يمكنها ان تزاحمه فانحرفت نحو الشمال الى الارض التى يَنزلها التركمانية الآن و بين هذه البحيره و التى كانت لوادى مردسيت مسافة عشر بعده و قد صارت تلك سبخة و حلة لا تخاض و تعرف بالتركية بحر سقرى اى بحر العذراء [فى الطره بخط غير خط البيرونى: بحر و قد حُرف الى دنكر وست و قد حرف الى قرى] *

ـ كر ابن العميد فى كتابه فى بناء المدن ان زلزلة كانت بالرويان منذ زمان ليس بالكثير و هدت جبلين حتى تصادما و سدّا الاودية التى كانت تسيل بينهما بالانسداد فتراجع الماء و صارت بحيره و هكذى الماء اذا لم يجد منفذا كثره زعُر المتة المجتمعة من ماء الاردن ـ و نقل ايضاً من تواريخ السريانيين ان فى سنة ثمان مائة و ثمان و ثلاثين للاسكندر و هى الثالثة من ملك يوسطنيانس قيصر كانت زلزله بأنطاكية و خسف و ان جبلا فوق قلودية انشق و وقع فى الفرات فانسدّ و ارتفع ماؤه حتى غرّق و خرّب ثم تراجع الماء وراءه حتى فتح لنفسه طريقا وعاد الى جريه *

و هذه ارض مصر قد كان النيل ينبسط عليها كما ذكر ارسطوطاليس فى كتاب الآثار العلوية فطفقها كانها بحر فلم يزل ينصب عنها و ييبس ما علا منها اولا فأولا و يسكن الى ان امتلأت بالمدن و الناس و ان جهلوا الآن مبدأ العماره ـ و قد كانت ارض مصر تسمّى فى القديم ثيبا باسم مدينة من مدائنها العليا التى سكنت اولا و هى غير مدينتها العظمى المسماه ممفياس (كذا) و هى منف و اميروس الشاعر و هو محدث بالقياس الى اوائل مصر يسميها فى شعره ثيبا ـ و حين كانت ارض بحرا حرص ملوك فى بعض استيلائهم على مصر ان يحفروا من القلزم اليها و يرفعوا البرزخ عما بين البحرين حتى يمكن المركب ان يسير من البحر المحيط فى المغرب و اليه بالمشرق

كل ذلك ارتفاقا و طلب نعيّم المصلحة و كان اولهم ساسطراطيس الملك ثم داريوس و حفروا مسافة مديده هى باقية الآن يدخلها ماء القلزم بالمد و يخرج بالجزر فلما قاسوا مقدار ارتفاع ماء القلزم امسكوا عما راموه خوفا ان يفسد القلزم نهر مصر لاشرافه عليه ثم تممه بطلميوس الثالث على يد ارشمدس بحيث حصل الغرض بلا ضرر ثم طمّه احد ملوك الروم منعا للفرس عن ورود مصر منه *

و هذه المغاره المعروفة نكركس كوه بين فارس و سجستان و خراسان ملئ من اطلال العمارات المدرسة يسميها بطلميوس قرمانيا الخربة اى كرمان الخربة و يذكر الفرس انها كانت اعمر البلاد بماء يجتمع اليها من قرب الف عين عظام نابعة من حوالى سجستان و ان افراسياب التركى عوّرها فانقطع الماء عن تلك البلاد وخربت و سالت بقية تلك المياه الى بحيره زَرَه و لم تكن قبل ذلك ـ و يعاين بقاع النشأم و غير ذلك من البرارى العديمة الماء و النبات و الحيوان آثار عادية تنطق ضروره بانها كانت آهلة و ان ذلك غير ممكن الا بماء كان لها ثم انقطع منها كما يرى آثار العمارات فى بطائح البصره و قد كانت الدجلة (كذا) تجرى على غير البطائح ثم انشقت الى هذه المواضع فعرقتها *

و ذكر ابو العباس الايرانشهرى انه حُفر برستاق نُسا من حدود نيسابور قناه فوجد على نيف و خمسين دراعا اصول ثلاثة اشجارس سرو قد نشرت بالمشار و معلوم ان الزمان بين مقطعها على وجه الارض و بين انكباس ما فوقه بالمقدار المذكور غير مضبوط لطوله على الثقل ثم لا يعجب من بقاء الخشب فيه فانه اذا بعد عن الموضع الذى يكثر قبوله للحر و البرد الدائرين فى السنة كان اطول بقاء *

و هذه خشبة جرجان و هى تخرج كل سنة من منبع ماء خروجا ينبت به اصلها و يدور على حافة العين رأسها و لأهل جرجان منها خرافات و تعظم لأمرها و ليست الا شجره سرو قد زلزلت ارضها فانشقّ و وقعت الشجره فى الشق ثم انضمت الارض عليها وصار الشق منبع ماء لايستقل برفع الشجره و قد عفنت اغصانها و سقطت فاذا ازدادت الموادّ فى الربيع استقلّ الماء حينئذ برفعها فبرزت و قد هى من عروقها

ما يحول بينها و بين البرور من اصل المسع كلها ـ و هو على ما دكر من عاص فيه
و لمسه كرأس تنور فيبقى ايام المد و اذا عاد الماء الى مداره رجعت الحشفة الى قراره
و ليس فى اهل تلك البقاع من يحصل لحديثها[1] على اول فقد علم ان العماره مسقلة
بسبب انتقال الماء لانها تابعة اياه *

NOTES

(1) I have not been able to find any reference to Abul 'Abbās al-Ērānshahrī elsewhere

(2) The Pajnākī Turks became in the 12th century potential enemies of the Russians in the Southern Steppes We find them here at the end of the 10th century still to the east of the Caspian

(3) In the name of the Karkas Kūh the Sin is clearly marked with 3 dots under the letter in the MS against Yāqūt who has a Shīn

(4) Though Bērūnī could read Greek letters well he frequently did not transcribe the *spiritus asper* and he writes Irqania for Hyrcania and Omeros for Homeros and this is confirmed also in his other works He is a little at sea in his account of ancient Egypt but it is noteworthy that he knew of the hundred gated Thebes which is mentioned in the Iliad of Homer

(5) A later hand has corrected Bērūnī in the ancient Turkish Khiz Tanqizī and on the margin of the MS we find Qyz Dengezi

(6) The eartnquake of Antioch mentioned occurred on the 29th of November 528 A C which was the second year of Justinian, as stated by Bērūnī

(7) Ibn al Amīd must be the celebrated Wazir of the Būyide sultān Rukn ad-Daula, but none of his works have survived

L'ARTE DELL'ESPORRE IN AL-BĪRŪNĪ

Per

PROF MARTINO MARIO MORENO,
dell' Università di Roma

La sapiente architettura del volume di al-Bīrūnī sull'-India è già stata segnalata da altri, a partire dal SACHAU nella sua prefazione, io mi propongo di esaminarla dal punto di vista didattico-estetico, monstrando in lui più ancora del dotto il maestro, più ancora dello scienziato l'artista Al-Bīrūnī non è un semplice erudito che fa sfoggio delle sue molte cognizioni, magari compiacendosi di avvolgerle, come molti dei suoi contemporanei, in una terminologia astrusa, o restando incapace di uscire dall'aridità del tecnicismo, egli è un cuore pulsante oltre che un cervello ragionante, il nuovo mondo che i suoi studi gli hanno rivelato ha fatto vibrare in lui le corde dell'umana simpatia lo ha animato d'una passione che brama di comunicarsi ad altri, e sa quindi trovare le vie più adatte per vincere la diffidenza e l'indifferenza ed accattivarsi l'interesse Perciò egli possiede in sommo grade l'arte del divulgatore Le sue doti di comunicativa risplendono soprattutto nella parte dedicata al pensiero filosofico-religioso dell'India

Nell'iniziare i suoi correligionari a un soggetto così astruso e insieme così delicato, al-Bīrūnī si comporta con il *savoir faire* di un aristocratico che voglia introdurre nel suo circolo un forestiero Prima di tutto egli mette in luce le affinità della sua educazione con quella di coloro che debbono riceverlo, mostrando che appartiene anche lui alla buona società (خواص) e ha una mentalità simile alla loro (متواة . معقولة), dopo aver così rotto il ghiaccio e stabilito una corrente di simpatia, ottiene dagli anfitrioni che si adattino alle originalità dell'ospite e magari alle sue stesse *gaffes* (متوة مردودة)

Il salotto più adatto a un incontro fra l'Induismo e l'Islam era senza dubbio, il Misticismo Al-Bīrūnī fa la sua presentazione precisamente in questo ambiente e chiama in suo aiuto una comune conoscenza che faciliterà l'affiatamento la filosofia ellenica Poi si passerà in biblioteca, e si discorrerà di astronomia e di altri argomenti scientifici Il metodo comparativo ha qui un'efficacia non soltanto didattica, ma anche psicologica

Però anche il terreno scelto per l'incontro-il Misticismo-è sdrucciolevole dal punto di vista dell'ortodossia islamica Ebbene, al-Bīrūnī ha il tatto di non cominciare con il *Paramâtman* ed *al-Ḥaqq*,

ma con *Içvara* ed *Allâh*, l'Allâh della teologia comune, salvo, poi, a passare a un Dio che, una volta affermata la, sua personalità, può rivelarsi impunemente come il Tutto

'La credenza degl'Indiani in Dio il laudatissimo - comincia al-Bīrūnī - è che Egli è l'unico l'eterno, che non ha fine nè principio, il libero (*muḫtâr*) nel suo agire, l'onnipotente, il sapiente, il vivente, il vivificănte, il regolatore (*mudabbir*), il conservatore, l'esente nella sua sovranità (*malakût*) dai rivali (*addâd*) e dai pari (*andâd*), Colui che a nulla è simile e a cui nulla assomiglia' (Pag 13 ed Sachau)

Sembra l'inizio d'un catechismo musulmano Ora in tutto ciò non v'è nulla che sia men che esatto dal punto di vista del teismo indiano, solo che nelle fonti la disposizione degli epiteti non sarebbe precisamente quella adottata da al-Bīrūnī, e verrebbero in luce dei particolari che rivelerebbere *Içvara* come un *Purusa* diverso, sì, dagli altri, ma sempre eguale ad essi in essenza, e quindi, benchè privo di superiori e di pari,[1] non tale nel senso assoluto della teologia musulmana ortodossa, che non ammette che Dio possa essere chiamato Spirito, oppure come l'*Ātman* non più preso nella purità della sua essenza, ma già compromesso dal suo rapporto con la *Māyā*, o *Prakṛti*, fonte essa, e non Lui, dell'agire Queste peculiarita non sono ignote ad al-Bīrūnī, tanto è vero che verranno in seguito, insieme con il parallelismo sufico della distinzione fra l'Essere dello '*ahl al-haqīqah*' e l *Allâh* dei *mutakallimîn*, ma intanto egli le tace perchè dal punto di vista oratorio conviene conciliarsi gli uditori, e dal punto di vista didattico procedere per gradi

Ancora Quale dei due metodi è più opportuno seguire nello esporre un sistema straniero scorporarlo, per introdurne a pezzi il contenuto nelle caselle del sistema nostro corrispondente, ovvero presentarlo in blocco così com'è ? L'uno e l'altro metodo hanno i loro inconvenienti Meglio di tutto è abbinarli, e così fa appunto al-Bīrūnī, prima mostrando quale risposta abbiano dato gl'Indiani a taluno dei quesiti più appassionanti della teologia musulmana, e poi facendoci della loro dottrina un'esposizione unitaria Non ci stupirà quindi che, a completare la serie delle proprietà di Içvara egli si fermi sull attributo del *kalâm*, che effettivamente anche la teologia indiana ha trattato, ma in un'altra luce, in un altro contesto — al punto che la scuole atee sostengono un *kalâm* (=*Veda çabda*) a sé stante, del tutte inconcepibile per i Musulmani—e faccia rilevare che anche per gli Indiani teisti Iddio è *mutakallim*, in quanto fonte della Rivelazione (pag 13, l 20 sgg)

Al-Bīrūnī dice ciò citando un estratto del *Kitâb Bātanjal* nello esercizio, cioè della sua arte di traduttore Con il *Kitâb Bātanjal* non lo possiamo seguire su questo terreno in modo completo e sicuro,

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[1] Vedi · J H Woods, *The Yoga System of Patañjali*, Cambridge Mass 1914, p 50

perchè l'originale ci è ignoto, siamo, invece, in grado di controllare i suoi procedimenti con la *Bhagavadgītā*

La prima citazione (pag 14, l 10–13) del poema sacro suona così

انا الكل من غير مبدأ بولاده و منتهى بوفاه ـ لا اقصد بفعلى مكافاه ـ و لا اختص بطبقة دون أخرى لصداقة او عداوه ـ قد اعطيت كلاً من خلقى حاجته فى فعله ـ فمن عرفنى بهذه الصفة و تشبه بى فى ابعاد الطمع عن العمل انحل وثاقه و سهل خلاصه و عتاقه *

'Io sono il Tutto, senza principio per via di nascita nè fine per via di morte Non cerco col mio agire ricompensa Non sto piuttosto con una casta che con l'altra per amicizia o inimicizia Ho dato a ognuna delle mie creature ciò che le occorre per il suo operare Di chi mi conosce in questo carattere, e si fa simile a me nel rimuovere il desiderio dall'azione, si scioglie il legame, e diviene facile la liberazione e l'emancipazione'

Com'è noto, inutilmente si cercherebbe, tutto di seguito, questo passaggio nella *Bhagavadgīta* Il Sachau segnala, come tradotto a senso, lo çloka 3° del canto X

Yo mām ajam anādim ca vetti, loka maheçvaram,
asammūdhah sa martyesu sarva-pāpaih pramucyate

'Chi mi conosce ingenerato e senza principio, supremo signore del mondo, si libera, scevro da errore fra i mortali, da tutti i peccati '

Secondo me, invece, l'autore ha presente il canto IV e il canto IX insieme

Per il concetto di 'senza principio e senza fine'

IV, 6 Ajo 'pi sann, avyayātmā, bhūtānām īçvaro 'pi san,
prakrtim svām adhisthāya, sambhavāmy, ātma-māyayā

Per i concetti di disinteresse, conoscenza della natura divina, assimilazione al Dio, emancipazione

IV, 9 Janma karma ca me divyam evam yo vetti tattvatah,
tyaktvā deham, punarjanma naiti, mām eti so 'rjuna
10 Vīta-rāga-bhaya krodhā, man-mayā, mām upāçritāh,
bahavo, jnāna-tapasā pūtā, mad bhāvam āgatāh

Per il concetto che ognuno ha avuto da Dio secondo il suo bisogno, e, ancora, che Dio è disinteressato, e che conoscendolo in tale natura si raggiunge la salvezza

IV, 13 Cāturvarnyam mayā srstam guna karma-vibhagaçah
tasya kartāram api mām viddhy, akartāram, avyayam
14 Na māṃ karmāni limpanti, na me karma-phale spṛhā
Iti māṃ yo 'bhijānāti karmabhir na sa badhyate.

'Pure essendo ingenerato, imperituro, e signore degli esseri, presidendo alla mia Prakṛti, io vengo al mondo in virtù della mia Māyā. Chi conosce a fondo in questa guisa il mio divino nascere ed agire, quando abbandona il corpo non incorre nella rinascita, ma viene a me, o Arjuna! Liberati dalla passione, dal timore, dall'ira, identificati a me, rifugiati in me, molti, purificati dall'ascesi della gnosi, sono entrati nella mia essenza. Ho create le quattro caste, ripartendone le qualità e i compiti: sappi che di esse l'autore sono io, pur inattivo e imperituro. Me non macchiano le opere, nè me ne attira il frutto: chi tale mi conosce, non è incatenato dalle azioni.'

Per il concetto d'imparzialità, con applicazione alle caste:

IX, 29 Samo 'ham sarva-bhūteṣu na me dveṣyo 'sti, na priyah
32 Mām, hi, Pārtha, vyapāçritya ye 'pi syuh pāpa-yonayah,
striyo, vaiçyās, tathā çūdrās te 'pi yānti parām gatim.

'Io sono equanime verso tutti gli esseri: nessuno m'è in odio, nè alcuno m'è diletto. ... Poichè, o Pṛthide, coloro che si rifugiano in me, anche se sono di infame origine, donne, agricoltori, servi, raggiungono il fine supremo.'

Come si è, dunque, comportato al-Bīrūnī traduttore? Ha fatto una scelta di versi entro due differenti canti e ne ha stralciato tutto ciò che per il momento non era ancora intelligibile ai suoi lettori integrandoli, per converso, con qualche particolare tratto da altri punti del poema. 'Io sono il Tutto' è l'idea direttrice del IV canto e del poema intero. L'adhiṣṭhāna e la māyā (che del resto al-Bīrūnī attaccato alla terminologia sāṃkhya, non menziona mai nel suo libro), sono stati omessi, per non ingenerare difficoltà. Del desiderio, del timore e dell'ira egli parlerà in seguito: non ritiene quindi il caso di farne per il momento l'enumerazione, e così si regola pure per le caste di cui dirà poi a lungo. Insomma il suo metodo è di non mettere troppa carne al fuoco. In luogo d'una traduzione abbiamo una parafrasi, ispirata a un sano criterio pedagogico. In pari tempo egli vuole che il suo testo sia nitido non solo per chiarezza, ma anche per venustà. Notate, infatti, la prosa rimata: il *mukāfāt* che fa eco a *wafāt* e l'*'itāq* che si contrappone anche nel suono al *withāq*. Dietro allo scienziato spunta il letterato.

Le citazioni biruniane della Bhagavadgītā sono disperanti, perchè nessuna trova corrispondenza esatta nell'originale. Si può col Sachau (Trad., vol. II, pag. 265) ricorrere all'ipotesi che egli avesse dinanzi un testo molto diverso da quello odierno: ipotesi soprattutto valevole per quelle citazioni che mancano completamente di riscontro; si può pensare che qualchevolta egli abbia fuso il testo col commentario; si può anche supporre che qualche citazione provenga non direttamente dal poema, ma da trattati riportanti di seguito versi tratti da canti diversi della Gītā; ma molte cose possono

essere spiegate semplicemente con questi criteri didattici ed artistici dell'autore

Ecco varie riprove di quello che ho detto

Negli çloka 7-8 del citato canto IV della Bhagavadgītā, il Beato dice di sé

Yadā yadā hi dharmasya glānir bhavati, Bhārata,
abhyutthānam adharmasya tadâtmānam srjāmy aham
Paritrānāya sādhūnām vināçāya ca duskrtām,
dharma-samsthāpanārthāya, sambhavāmi yuge yuge

'Tutte le volte che declina la virtù ed insorge il vizio, allora, o Bharatide io ricreo Me stesso A difesa dei buoni, a sterminio dei malfattori, io rinasco di evo in evo, per restaurare la legge'

Al-Bīrūnī traduce 'E tutte le volte che ho desiderato venire a scopo di riforma (الاصلاح), ho rivestito un corpo, perchè non è possibile stare fra gli uomini senza farsi uomo' Egli riassume un concetto che nell'originale si distende fra due çloka nella pregnante parola araba *içlâh*, e aggiunge per comodo dei lettori una chiosa (pag 26, l 5–8) E la sua traduzione riesce elegante e chiara, senza essere infedele

Un altro bell'esempio di traduzione essenzializzata si incontra a pag 26, l 13–16, dove in un arabo scorrevolissimo al-Bīrūnī riproduce non solo la sostanza, ma anche i particolari più significativi, dell'involuto passaggio della *Bhagavadgītā* (VI, 40–45) relativo al ciclo delle incarnazioni

Egualmente son conservate e rese con perfetta grazia di stile arabo, sobriamente ornato di rime, le espressioni più vivide del lungo brano della Gitā (canto II) in cui Krsna prova ad Arjuna che egli può sterminare senza rimorso i suoi avversari Nulla davvero perde l'originale ad essere sfrondato del superfluo (vedi pag 13, l 25 sgg) Al-Bīrūnī non cerca nella Gitā soltanto la teoria ne sente e ne rende anche la poesia

La rima è adoperata dal nostro anche ad effetto didattico allo scopo, cioè, di imprimere anche fonicamente nello spirito gli accostamenti e le opposizioni dei concetti Così dei tre *guna*, chiamati 'le tre forze', egli dice

فالاولى راحة طيبة منها الكون و النماء ـ و الثانية تعب و شدة، منها الثبات
و البقاء ـ و الثالثة فتور و عمه، منها الفساد و الفناء *

Ben detto ed esattissimo insieme! Così i tre mondi sono *li-l-iktisâb*, *li-l-thawâb* e *li-l-'iqâb* *azione*, *punizione*, *premiazione* (pag 29, l 10)

Ecco un elegante traduzione dal *Kitâb Bātanjal* (p 27, l 16 sgg e pag 28, l 1)

اما مثال النفس فمما من علائق الجهل التي هي دواعي الرباط كالارز في ضمن
قشره فانه ما دام معه كان معدا للنبات و الاستحصاد - مرددا بين التولد و الاتلاد -
فاذا ازيل القشر عنه - انقطعت تلك الحوادث عنه - و صار له البقاء على حاله ....
قال السائل : كيف تكون حال الروح اذا خلصت من الاحوال و الآثام - ثم امسكت
عن الفوائد للانعام و الانعام؟ قال المجيب، تردد بحسب ما قدمت و اجترحت
فيما بين راحة و شدة، و تصرف بين ألم و لذة *

Basta questo brano a darci un'idea dell-arte di al-Bīrūnī come traduttore Nell'ultima frase c'è anche una reminiscenza coranica (جزاء بما قدمت ايديهم), come ci sono rispettivamente a pag 14, l 17, pag 26 l 18, e pag 26, l 15 un لم يلد و لم يولد, un قضاء سابق e un الهام قدسي che non rappresentano per nulla intrusi ideologici in quei contesti

Passiamo così ad esaminare un altro degli aspetti dell'espositiva di al-Bīrūnī Non possiamo rendere un pensiero straniero senza convertirlo in una certa misura nei termini d'un pensiero che ci sia familiare Nel tradurre il *Sāmkhya* e il *Pātañjala* al-Bīrūnī si vale di vocaboli tecnici della filosofia e della teologia araba con altrettanta legittimità con quanta il Woods, per esempio, ricorre per lo Yoga alla nomenclatura, non sempre perspicua, della psicologia anglo sassone Ma egli usa press'a poco le stesse cautele di un coscienzioso indianista moderno, e come questi indulge alla pura e semplice trascrizione di vocaboli sanscriti E' interessante seguirlo in questo sforzo

Ottime solo per esemplificare-le traduzioni هيولى مجرده مادة مصورة مادة per *avyakta*, *vyakta* e *prakṛti*, la presentazione dei tre *guna* come di tre potenze (قوى) prime agevola la comprensione della lore natura, notevole il vocabolo di ضروريات coniato per rendere *karmendriyāni*, passabile *qalb* per *manas* sebbene al-Bīrūnī abbia il torto di ridurre la funzione di quest'organo a pura volontà, poco felice la conversione di *ahamkara* in *tabī'ah* (natura) con una falsa spiegazione del concetto di *abhimānu* Che sarà l'ellenico *ḫayr mahd* (خير محض) applicato al Dio indiano (pag 13 l 19)? Il *sad* del Brahman che è *saccidānanda* o il *çūddhasattva* di Içvara? I *devās* imbarazzano al-Bīrūnī, un po' ne fa dei *rūhāniyyun* e un po', addirittura, dei *malā'ikah* (Angeli), ma dopo avere bene spiegato come la lingua araba non tolleri che sian chiamati

ālihah (dei), e quale distanza li separi effettivamente nel sistema indiano dall'Ente Supremo

Ma anche quando le sue identificazioni o approssimazioni non sono del tutto felici, egli non tradisce mai il pensiero che va esponendo, perchè la preoccupazione di renderlo chiaro ed accessibile non lo trascina mai a manipolazioni arbitrarie Al-Bīrūnī è ben lontano dal cedere alla tentazione di fare del sincretismo, alla quale si abbandenerà invece in pieno, trattando in parte la stessa materia, un Dārā Šikūh Conosciamo in Europa un Vedānta travestito alla hegeliana, un'anima indiana presentata secondo il gusto romantico, certi pasticci teosofici portati in giro per gli alberghi di lusso al-Bīrūnī, invece, se è lieto quande le idee indiane coincidono con quelle dell'Islam o della filosofia greca, non tenta mai di ficcarle per forza in recipienti che non le contengono, anzi, quanto più sono peregrine ed ostiche, tante più si affatica a romperne la dura scorza, e ci riesce egregiamente

Si ammiri con quanta maestria, nonostante le piccole inesattezze di dettaglio, egli disegni le linee del sistema Sāmkhya-Yoga, difficili a ricavarsi (ben lo sanno i Sanscritisti), dagli arruffati Sūtra e dai loro non meglio ordinati commenti

L'onestà scientifica dà alla sua esposizione la esattezza, la lucidità del pensiero la dà l'ordine, che è bellezza, e a questa bellezza altra ne aggiunge la passione per il soggetto, che infonde nel suo stile colorito e calore

Per queste ragioni leggiamo ancora oggi, dopo mill'anni, con profitto e diletto il suo capolavoro frutto d'intelletto e d'amore

AL-BERUNI ET LA VALEUR INTERNATIONALE DE LA SCIENCE ARABE

Par

Louis Massignon

On donnait il y a deux mois à Paris une série de conférences fort remarquées sur l'histoire des religions, discipline essentielle pour les scientifiques, car elle donne à la fois la courbe, construite par points du progrès expérimental des découvertes, et une perspective psychologique sur la structure de l'imagination des découvreurs et des inventeurs. C'était George Sarton, l'auteur d'une monumentale 'Introduction to the History of Science (Ier volume, Baltimore 1927, le Vème volume vient de paraître il mène jusqu'à la fin du XIVe siècle), où il a marqué que la première moitié du XIe siècle doit être représentée du point de vue international par Beruni bien plus que par Avicenne (Ibn Sina). Esprit critique, tolérance, amour de la vérité, courage intellectuel, telles sont les qualités maîtresses de ce mathématicien, explorateur des routes d'échange èconomique et intellectuel, comparatiste des philosophies et même des mystiques entre l'Inde et la Grèce, et des calendriers liturgiques, des fêtes mazdéennes aux fêtes juives, chrétiennes, et musulmanes.

En mathématiques, Wiedemann et Suter ont souligné l'originalité de Beruni pour les chiffres dits hindous (principe de position), les progressions géométriques (à propos du jeu d'échecs), la trisection de l'angle et les problèmes non solubles au moyen de la règle et du compas seuls. En géographie, la projection stéréographique, la cartographie, la géodesie, la détermination des densités spécifiques de dix-huit minéraux et métaux précieux, l'incommensurable supériorité de la vitesse de la lumière par rapport à celle du son, l'explication des puits artésiens, de certains cas tératologiques, du nombre toujours pair des pétales des fleurs (phyllotaxie) la construction de l'astrolabe sphérique.

Né Kharezmien, c'est-à-dire parlant un dialecte iranien du Nord, à empreinte turque (ce qui pose le problème des Qarluq etudié par Minorsky), né musulman sunnite, à tendances ismaéliennes, par universalisme philosophique (ce qui le différencie du shi'isme raciste des imamites qui est surtout dévotion sentimentale) il admirait le grand médecin Razi malgré son irréligion il tient de lui l'idée de progrès. Alors que Razi s'est montré assez sévère pour la grammaire arabe, Beruni admire la puissance d'abstraction de la langue arabe pour lui, la science internationale doit s'exprimer en arabe.

Comme beaucoup d'écrivains arabes, il a passé sa vie en dehors des pays arabes, mais de l'année 1017 à 1048, année de sa mort, il a été principalement en Afghanistan résidant à Ghazni, capitale de la dynastie Ghaznawide C'est là qu'il a écrit, en dehors de sa chronologie (écrite en Jurjan en l'an 1000) ses principaux ouvrages sur l'Inde, sur l'astronomie (*Qanun Mas'udi* et *Tafhim*), le catalogue des oeuvres de Razi (cent trois titres), le catalogue de ses propres oeuvres (cent treize titres), le livre des drogues, le livre sur les mines et les pierres précieuses, enfin la traduction du livre de *Patanjali* (en sanscrit) sur le *Yoga* dont nous avons retrouvé le manuscrit à Istambul (étudié par Hauer) J'ai visité Ghazni in 1945

Beruni a parfaitement compris le rôle international de l'arabe comme principale langue sémitique de civilisation sa puissance de condensation et d'abstraction, sa syntaxe interne par infixes significatifs, non par affixes accolés, sa valeur d'unification, sa morphologie dominatrice (structuralisation de la parataxe)

Mathématicien, il a pris le virage des sciences mathématiques vers leur orientation moderne atomisme occasionaliste et quantique, projection des nombres dans la durée discontinue (semis stellaires d'instants) étude des nombres ordinaux singuliers, ayant spécificité experimentale, algébrisation de l'imagination mathématique

En une célèbre preface du livre des drogues il dit 'c'est dans la langue arabe que les sciences ont été transmises par traductions venant de toutes les parties du monde, elles s'y sont embellies, ce qui leur a permis de s'insinuer dans les coeurs, et les beautés de cette langue ont circulé avec ces sciences dans nos artères et dans nos veines Et s'il est vrai qu'en toute nation on aime à se parer de la langue à laquelle on est resté attaché pour s'être accoutumé à l'employer avec ses amis et compagnons selon ses besoins, j'en dois juger par moi-même et par ma langue natale, Kharezmienne où une science serait aussi étonnée de se voir éternisée qu'un chameau de se voir dans la rigole de la Ka'ba, ou une girafe de se voir parmi des purs sang Et si je compare l'arabe au persan, deux langues dont je me sens intimement le familier, j'avoue préférer l'invective en arabe à la louange en persan Et l'on reconnaîtra le bien-fondé de ma remarque si l'on scrute ce que devient un texte scientifique une fois traduit en persan, il perd toute clarté, son horizon s'estompe, ses linéaments se brouillent, sa portée pratique disparaît La vocation de la langue persane c'est de perpétuer des épopées historiques sur les rois de jadis et de fournir des contes pour les veilles nocturnes ' (On reconnaît ici le contemporain de Ferdossi et des premières Mille et une Nuits)

Je pressens ici une objection toute langue internationale scientifique dénationalise, vous nous montrez un Beruni qui par une sorte de parti-pris abstrait pour la supériorité technique de l'arabe, renie la race iranienne dont sa famille kharezmienne, était

issue En ce temps de renaissance des nations orientales Beruni prend figure de traître ou d'otage ?

Non pas, il a entrevu l'idéal supra-national d'une langue universelle dont la beauté pure l'a séduit pour son esthétique transcendantale En travaillant d'ailleurs comme tant d'autres grands iraniens médiévaux au perfectionnement du lexique technique de l'arabe, considéré comme langue privilégiée pour les échanges intellectuels entre savants, Beruni a réalise un progrès que seule son origine aryenne pouvait réaliser dans ce domaine La langue arabe, comme toutes les langues sémitiques contient beaucoup de racines ambivalentes (elle n'est pas seulement la langue du *Dâd*, mais la langue des *addâd*) et il fallait des écrivains de souche aryenne pour faire prendre ainsi à l'arabe conscience de tout son destin, pour poser un choix volontaire entre les deux sens contrastants de mots arabes devenant ainsi inducteurs, générateurs d'une structure philosophique positive et orientée Beruni apparaît ici comme le chaînon le plus illustre d'une longue chaîne d'écrivains comparatistes depuis la plus antique caste des scribes iraniens Soghdiens qui ont organisé l administration des Achéménides et des Sassanides avant de fournir le lexique technique des parlers turcs d'Asie centrale jusqu'à la fameuse caste hindoue des Kayasthas, qui chargée par le Sultan de Delhi de la tenue des registres de l'impôt foncier a traduit en persan entre autres chef-d'oeuvres classiques de l'Inde sanscrite les Upanichads rapportees en Occident par Anquetil Duperron Car la langue arabe, la science arabe, des savants musulmans ont réuni comme l'empire islamique l'heritage grec avec l héritage hindou dans une synthèse qui n'est pas une simple accumulation mais une ascension dans le progrès mondial Dans le sens, précisément, de ce véritable orientalisme, qui n'est ni une manie d'exotisme, ni un reniement de l'Europe, mais une mise à niveau entre nos méthodes de recherches et les traditions vécues d'antiques civilisations dont l'expansion économique, colonisatrice de l Europe et de l'Amérique a cru pouvoir disposer à bon marché, alors qu elle recèle en profondeur une expérience sociale de la vie, un sens de paix sereine, dans la justice, qu'a personnalisés admirablement un fils de cette Inde qui avait passionné Beruni, une grande âme orientale, Gandhi, dont cette étude faite l'annee de sa mort (mort pour qu il soit rendu justice à l'Islam indien), ne pouvait pas ne pas rappeler l incomparable destin

AL-BIRUNI SUGLI INIZI DEL CRISTIANESIMO A MERV

Per

GIUSEPPE MESSINA, S J

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La città di Merv dal secolo VI dopo C appare come uno dei principali avamposti del territorio iranico, da cui si diffuse il cristianesimo nelle regioni dell'Asia Centrale Centro di studi e di formazione, i giovani missionari vi trovavano tutto l'occorrente per la loro istruzione e preparazione, nodo importante di commercio, si poteva considerare come la porta più diretta alla capitale della Battriana e alle vie, che da questa si dipartivano verso l'estremo Oriente

La prima volta che spunti un vescovo di Merv in atti ufficiali è l'anno 424, dagli Atti Conciliari risulta che in quell'anno Barshabba, vescovo della città, prese parte al Concilio, indetto dal patriarca Dadhisho [1] L'esistenza di un seggio vescovile, divenuto poi arcivescovile, si può seguire negli stessi Atti dal 424 fino al 585 Non si pensi però che dopo quest'ultima data la sede sia scomparsa, perchè da altri documenti risultano i nomi di arcivescovi fino al secolo XI, alla vigilia, cioè, delle invasioni dei mongoli i quali distruggendo e radendo al suolo molti centri abitati dell'Iran e poi passando all'Islam, diedero un colpo mortale alla gerarchia cristiana. Tra questi vescovi uno dei più conosciuti è Elia di Merv, vissuto al tempo dell'invasione dell'Iran da parte degli arabi Quando Isdegerde III nel 651 652 venne ucciso in tale località, fu proprio Elia, secondo quello che ci viene narrato da Tabari, a dare allo infelice re onorata sepoltura Con i suoi cristiani andò a ripescarne il cadavere nel fiume, in cui era stato gettato, e lo pose in un mausoleo, ch'egli aveva eretto nel giardino dell'arcivescovado 'Conviene, diceva il prelato ai suoi cristiani, che facciamo lutto per l'uccisione di questo nobile re, a causa dei benefici ricevuti dai suoi antenati e dell'appartenenza di sua madre Shirin al Cristianesimo ' [2]

Sugli inizi però del Cristianesimo in Merv non abbiamo se non una sola notizia, che ci viene data da Albiruni Nella sua opera الآثار الباقية عن القرون الخالية si dice و في الحادي و العشرين

ذكر ان برشبا المطران الذي ورد مرو بالنصرانية بعد المسيح بنحو مائتي سنة

'F. nel giorno 21 (del mese Hazirân = giugno) commemorazione del

[1] Chabot, *Synodicon Orientale*, p 43, 18 [2] Tabari, ed Lugd Bat I, 2884

sacerdote Barshabba, il quale portò il Cristianesimo in Merv circa 200 anni dopo Cristo".[1]

Precedentemente Albiruni aveva affermato di voler dare il calendario religioso dei cristiani melchiti, stabiliti nella sua patria Khwarizm (oggi Chiwa).[2] La notizia quindi su Merv gli viene dai cristiani.

Per controllarne il valore, ci viene a proposito ciò che Mari,[3] e con maggior ricchezza di particolari la Cronaca di Seert[4] ci tramandano su un tale Barshabba e sulla sua opera a Merv. Seguiamo quest'ultima.

Secondo la Cronaca, Barshabba "era uno dei prigionieri, che Sapore figlio di Ardashir, aveva deportati dall'Occidente". Apprese la lingua siriaca a Seleucia-Ctesifonte ed anche il persiano. Insigne nella pietà, esemplare nei costumi, istruito anche in medicina, la sua fama pervenne a Sapore, il quale lo chiamò alla corte per curare la malattia della moglie. Egli riuscì a guarirla e in seguito a ciò Sapore gli concedette il suo favore.[5] Segue poi il racconto della sua andata a Merv e del suo apostolato, ma prima di trattarne, fermiamoci a queste notizie.

Il re Sapore qui menzionato, essendo figlio di Ardashir, potrebbe essere o Sapore I, figlio di Ardashir I, o Sapore III, figlio di Ardashir II. Ma la notizia della deportazione di cristiani dall' Occidente non lascia alcun dubbio che si tratti di Sapore I, che regnò dal 241 al 272. Questi difatti, in lotta contro i romani, invase le terre della Siria, ad essi sottoposte, una prima volta nel 256 e una seconda volta, probabilmente nel 260, quando sconfisse l' imperatore Valeriano e lo fece prigioniero. In entrambe le spedizioni egli deportò ecclesiastici e laici cristiani dalle città della Siria e li stabilì nella Susiana, nella Perside e in Babilonia e in altri luoghi.[6] Tra questi prigionieri, secondo la Cronaca, si trovava anche Barshabba.

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[1] Nell'edizione di Sachau testo, p. 299, 14, vers. inglese in *Chronology of Ancient Nations*, London, 1897, p. 296. Sachau nel testo ha برشيا, nella versione *Berekhya*; in seguito però lesse برشبا, *Barshabba*, nome attestato anche in altri documenti. Cf. *Die Christianisierungs Legende von Merw* in *Abh. zur Semitischen Religionskunde und Sprachwissenschaft* Wolf W. Grafen von Baudissin überreicht, Giessen 1918, p. 409. Nella nuova edizione del calendario melchita di Albiruni in *Patrologia Orientalis* X. 306 Rob. Griveau ha nel testo برشبا, nella nota invece propone di leggere برشبا, *Barshabia* e rimanda ad un passo della Cronaca di Seert, *Patr. Or.*, V, 253–8, in cui peraltro sta *Barshabba*, non *Barshabia*.

[2] Sachau, testo, p. 288, vers. 283.

[3] *Maris Amri et Slibae de patriarchis Nestorianorum commentaria*, ed. e trad. da Henr. Gismondi, Romae 1899 testo, I, p. 26s., vers. p. 23.

[4] Edita sotto il titolo di *Histoire nestorienne*. La parte che qui c'interessa apparve in *Patr. Or.* V, 253 ss. Testo di Addai Scher, vers. di Pierre Dib.

[5] *Patr. Or.*, V, 253.

[6] Così la Cronaca di Seert, *Patr. Or.*, IV. 220–223; i suoi dati si accordano con quello che riferiscono altre fonti, e vengono ora lumeggiati da un'iscrizione di Sapore

Se prestiamo fede a ciò che ci narra la Cronaca che Barshabba visse al tempo di Sapore I, le notizie ch'essa ci dà in seguito sul suo apostolato a Merv devono riferirsi ad un epoca di qualche anno posteriore alla prima deportazione del 256 o alla seconda del 260 Avremmo così una certa corrispondenza con ciò che afferma Al-biruni, quando riferisce che a Merv il cristianesimo fu introdotto da Barshabba circa 200 anni dopo Cristo Se il computo si fa dalla morte di Cristo, i 'circa 200 anni' di Albiruni vanno intesi come approssimativamente 230 anni dopo C

È attendibile questa notizia?

Una grave difficoltà viene subito dal seguito del racconto della Cronaca su Barshabba Eccolo in riassunto [1]

Sapore aveva sposato una sorella a nome Shiraran [2] Questa fu colpita da una malattia, ribelle a tutte le cure di medici, magi ed astrologi [3] In un sogno sentì parole di conforto ed ebbe l'annunzio ch'essa sarebbe divenuta serva di Dio In seguito a ciò fece chiamare Barshabba dalla chiesa di Seleucia, il quale la istruì nella religione cristiana, la battezzò e la guarì Sapore adirato la volle far morire, però trovandosi di passaggio alla corte un principe sassanide, il marzuban (marchese) di Merv di ritorno da Nisibi dopo la pace conchiusa con Gioviano, gli comandò di condurre seco Shiraran, per allontanarla così dai cristiani, e gli diede anche la facoltà di sposarla, ciò ch'egli fece Shiraran prima di partire pregò i prelati cristiani di consacrare Barshabba vescovo, perchè dopo l'uccisione del patriarca Barbeshmin la sede patriarcale era vacante, avendo Sapore impedita la nomina di un suo successore

A Merv Shiraran si diede a far proseliti per la religione cristiana ed ebbe felice successo tra i greci stabiliti nella città, discendenti da quelli che vi erano venuti con Alessandro, fece costruire una chiesa, secondo il modello del palazzo regio, e la chiamò Ctesifonte Ebbe un figlio dal marzuban e l'annunziò a Sapore pregandolo d'inviare Barshabba, di cui aveva bisogno per curare la sua salute Il re, lieto dell'evento, accondiscese, e Barshabba partì con altri preti, forniti di tutto l'occorrente per il culto Fu ricevuto a Merv con grandi onori, guarì ammalati, battezzò molti magi costruì chiese e le doto con compere di campi e vigne I suoi discepoli si diffusero

I, scoperta recentemente nella Kaaba di Zardusht a Naqsh-i Rustam Cf il mio libro *Cristianesimo Buddhismo Manicheismo nell'Asia antica* Roma 1947, p 51–53

[1] L c V, 254–57

[2] Sachau, *Christianisierungs-Legende* p 406 emenda Sherzad, ma questo nome, come anche il suo equivalente, Sherazad, che significa 'libero nobile come un leone,' quando ricorre, è applicato generalmente ad uomini, non a donne L'unica eccezione si trova in Masudi 4, 207, in cui si designa così una regina Cf Ferd Justi, *Iranisches Namenbuch*, p 298, 295

[3] *Mari*, Gismondi, l c afferma essersi trattato di epilessia

nelle città del Chorasan, costruirono chiese e battezzarono gli abitanti.

Si racconta in seguito che Barshabba venne a morte, ma per le preghiere dei cristiani risuscitò, e si fa notare che alcuni prestarono a ciò fede, altri no. Alla sua morte egli venne considerato come il primo arcivescovo di Merv. I figli di Shiraran non divennero cristiani, ma restarono nella religione dei magi, come il loro padre, ebbero però verso i cristiani grande benevolenza.

Fin qui il racconto della Cronaca, da cui possiamo estrarre alcuni dati cronologici.

Barbeshmin morì martire nei primi anni della persecuzione di Sapore II nel 346. Inoltre la notizia che si dà sulla vacanza della sede patriarcale dopo la sua morte corrisponde a verità, difatti solo nel 383, quando cessò la persecuzione con la morte di Sapore II e del suo successore Ardashir II, appare un nuovo patriarca nella persona di Tomarsa. La conclusione della pace con Gioviano avvenne nel 363. Ora tutte queste date concordano tra di se, ma sono in disarmonia con quello che la Cronaca aveva detto prima. La prospettiva cronologica non è più quella dell'inizio del racconto, l'epoca cioè di Sapore I, ma quella di Sapore II, che ebbe un lungo regno dal 309 al 379. Abbiamo così nella Cronaca su uno stesso personaggio due datazioni differenti, che differiscono di circa un secolo.

Una via, per mettere d'accordo ciò che si narra nella prima parte con quello che si dice nella seconda parte della Cronaca, sarebbe quella seguita dal Sachau, il quale interpreta il passo iniziale di essa nel senso che Barshabba era non un deportato di Sapore I, ma piuttosto un discendente di una delle famiglie cristiane deportate da questo re.[1] Ma l'ovvio tenore del testo non sembra favorire tale interpretazione: esso parla di un deportato di Sapore I e non di un discendente di deportati: كان هذا الرجل من السبى الذى سباه سابور بن اردشير من المغرب. Inoltre la spiegazione del Sachau ci toglierebbe la possibilità di intendere la notizia di Albiruni, il quale non arriva con un computo suo personale alla datazione dell'introduzione del Cristianesimo a Merv da parte di Barshabba a circa 200 anni dopo Cristo, come pensa l'illustre maestro,[2] ma questa data piuttosto gli sarà stato fornita dal calendario religioso dei melchiti o dai cristiani stessi. E la Cronaca di Seert, composta non molto dopo il 1036, quindi pochi decenni dopo l'opera di Albiruni, parlando di un Barshabba del tempo di Sapore I, mostra che tale era l'opinione dei cristiani sugli inizi del Cristianesimo in Merv circa l'epoca, in cui scriveva Albiruni.

[1] *Die Christianisierungs Legende*, l. c., p. 406.
[2] Ib., p. 409.

Da parte nostra inclinamo piuttosto a pensare che l'autore della Cronaca mischia e confonde insieme due personaggi dello stesso nome, che si occuparono di diffondere il Cristianesimo in Merv a circa un secolo di distanza. E le ragioni che ci inducono a questa soluzione sono sopratutto due.

Anzitutto già nella narrazione della Cronaca salta agli occhi una certa discontinuità, la quale induce a pensare alla fusione di due racconti originariamente indipendenti. Dopo aver narrato della guarigione della moglie di Sapore I da parte di Barshabba, passa senza alcun legamento a parlare di una sorella del re, che questi 'aveva sposato secondo il costume dei magi', guarita anch'essa da Barshabba. La prima frutta il favore del re, la seconda la sua ira. Tale confusione non sembra esistere nella narrazione parallela e succinta di Mari, nella quale tutto viene riferito al Barshabba del tempo di Sapore II. Differisce peraltro dalla Cronaca in un punto: mentre questa parla di Shiraran sorella-sposa del re, la quale convertita viene mandata a Merv, Mari sdoppia questo personaggio e parla della moglie e della sorella del re, le quali entrambe seguono Barshabba a Merv.[1] Si noti ancora che Mari non parla in alcun modo della prima penetrazione del Cristianesimo a Merv.

Inoltre il testo stesso di Albiruni esige che si distingua un Barshabba del secolo III da un omonimo del secolo IV. In esso l'apostolo, che introdusse il Cristianesimo a Merv, viene detto 'sacerdote', non 'vescovo'. Se egli avesse inteso parlare del Barshabba del tempo di Sapore II, non avrebbe mancato di chiamarlo 'vescovo'. Il contrario sarebbe stato contro l'uso constante di Albiruni, come si rileva da ogni pagina del suo calendario, il quale non tralascia mai di aggiungere il titolo di dignità ai santi commemorati nei vari mesi dell'anno. Si veda come egli ci tenga a distinguere i titoli della gerarchia cristiana in ciò che dice sul mese Tishrin I.[2]

Dobbiamo quindi distinguere un Barshabba 'sacerdote' che dette inizio all'evangelizzazione di Merv nel secolo III, da un suo omonimo, che operò un secolo dopo e fu il primo vescovo della città. Si può domandare se quest'ultimo sia identico con quel vescovo Barshabba, che fu presente al Concilio convocato da Dadhisho nel 424, di cui abbiamo parlato all'inizio. Sachau ne dubita, perchè egli allora avrebbe avuto 81 anno di età.[3] Ma se si tien presente che la Cronaca gli da lunga vita e lungo episcopato,[4] il dubbio di Sachau non dovrebbe impedire dall'ammettere che il vescovo presente al Concilio era quello di cui parla la Cronaca. Riassumendo possiamo dire che nella Cronaca i due personaggi sono confusi per ragione dell'omonimia, ma ciò non sarebbe bastato,

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[1] Ed. Gismondi, testo, p. 26, l. 20s., vers. p. 23.

[2] Testo, p. 289, vers., p. 283 s.

[3] *Die Christianisierungs-Legende*, p. 407.

[4] L. c., V, p. 257.

se l'uno e l'altro non avessero svolto il loro apostolato nella medesima città di Merv Oltre l'omonimia c'era dunque analogia di opere Pur non riuscendo ora possibile di distinguere nella relazione della Cronaca gli elementi che riguardano il primo apostolo da quelli che si riferiscono al secondo, ciò peraltro che essa narra sugli inizi del cristianesimo in Merv non può essere attribuito se non al primo, al Barshabba 'sacerdote' L'autore della Cronaca, o la sua fonte, l'attribuisce invece al vescovo dello stesso nome, forse perché era più noto, essendo di epoca più recente, o di maggiore dignità

Essendoci serviti della Cronaca di Seert per controllare e illuminare la notizia di Albiruni sugli inizi del Cristianesimo a Merv, occorre domandarci quale valore si può attribuire a ciò che essa racconta sull'apostolo Barshabba

Vari punti della narrazione sono tali da ispirare fiducia nelle informazioni, ch'essa ci dà Quanto si dice sulla sede patriarcale vacante dopo il martirio di Barbeshmin e sulla pace con Gioviano corrisponde con quello che sappiamo da altre fonti La notizia sulla chiesa costruita a Merv e chiamata Ctesifonte può essere messa in rapporto con quella di uno scrittore arabo,[1] il qual afferma che un quartiere della città era chiamato con lo stesso nome e sarà potuto essere il quartiere dei cristiani Nel riferimento alla dotazione delle chiese con campi e vigne, l'autore mostra buone conoscenze delle condizioni locali L'affermazione che i figli di Shiraran non divennero cristiani, ma seguirono la religione dei magi, come il loro padre, dà prova di serena oggettività in un autore a cui doveva premere l'esaltazione del Cristianesimo Tutti questi punti sono stati messi in giusto rilievo dal Sachau [2] Aggiungiamo che l'autore della Cronaca, narrando la risurrezione di Barshabba, non manca di far notare onestamente i dubbi di alcuni su tale fatto Tutti questi elementi danno testimonianza della serietà e probità dello autore e ispirano fiducia anche su quello ch'egli dice sulla introduzione del Cristianesimo a Merv

Però per arrivare alla piena certezza, dovremmo disporre di fonti più vicine agli avvenimenti, e questo purtroppo non è il caso nostro L'istoriografia ecclesiastica della chiesa sira prende i suoi inizi al secolo VII e si serve di fonti, che non ci sono pervenute Il Sachau pensa che la fonte, da cui piglia il nostro autore potrebbe essere quel tale Elia, il quale fu arcivescovo a Merv nel secolo VII, identico forse a quell'Elia, che diede sepoltura all'ultimo re sassanide [3] Come capo della chiesa di Merv, il prelato, noto anche per il suo apostolato presso i turchi, doveva aver interesse a conoscere e tramandare i fasti della sua chiesa fin dagli inizi Ma siamo a quattro secoli di distanza dal fatto di cui trattiamo, e non ci riesce di conoscere dove egli abbia attinto le sue notizie

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[1] Jaqut III, 570 [2] L c, p 406s. [3] L c, p 405, 408

Nell'assenza di fonti più antiche, possiamo porci il quesito, se la notizia trasmessaci da Albiruni e dalla Cronaca sugli inizi del Cristianesimo a Merv trovi appoggio nelle condizioni, in cui vivevano i cristiani in Persia durante il regno di Sapore I, inoltre se essa è in armonia con ciò che dello sviluppo del Cristianesimo in Oriente possiamo conoscere da altre fonti.

I deportati di Sapore I, stabiliti, come abbiamo visto, in alcuni centri principali dell'impero persiano, furono adibiti a lavori agricoli e ad opere tecniche, come la canalizzazione delle acque e la costruzione di ponti e dighe. Di questo loro lavoro resta ancor oggi un ricordo nella diga costruita nella Susiana, detta anche ai nostri giorni 'diga di Cesare'.[1] Sotto il rispetto religioso Sapore I diede prova di larga tolleranza e si mantenne lungi dal restringere il suo favore esclusivamente alla religione dei magi. Egli si mostrò benevole verso Mani, il quale afferma: 'mi presentai al re Sapore, mi ricevette con grande onore e mi permise ch'io pellegrinassi e predicassi la parola della vita'.[2]

Uguale atteggiamento ebbe Sapore verso i cristiani, ch'egli aveva stabiliti nelle sue terre. L'autore della Cronaca di Seert, a cui non può certo attribuirsi il partito preso di difendere gli atti del re, afferma che i cristiani ebbero terre da coltivare senza alcun pagamento, ed aggiunge che essi nella nuova terra pervennero ad un benessere maggiore di quello, di cui avevano goduto nella loro patria. Essi erano liberi di seguire la loro religione e di vivere conforme alle sue norme; a Rev Ardashir, città la quale divenne in seguito il centro più importante ed influente della gerachia cristiana, come sede arcivescovile della Perside, essi avevano due chiese, l'una quella dei romani, l'altra quella dei siri nelle quali il culto si svolgeva rispettivamente in greco e in siriaco. Ed aggiunge: 'Dio pose (i cristiani) in favore presso i persiani … e per mezzo loro il cristianesimo si diffuse nell'Oriente'.[3] Come i manichei anche i cristiani avevano la libertà di muoversi e far propaganda e l'hanno fatto con felice risultato. La notizia quindi dell'introduzione del Cristianesimo a Merv al tempo di Sapore I non ha nulla d'inverosimile, anzi si accorda bene con le condizioni, in cui vivevano i cristiani nel territorio iranico.

Anche ciò che sappiamo sullo sviluppo del Cristianesimo, in tempi vicini a quelli di Sapore I, s'inquadra bene con la notizia

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1 Cioé, dell'imperatore Valeriano, prigioniero di Sapore I. Jaqubi (ed. Houtsma) p. 180, 1, la chiama 'ponte' e afferma: 'il duce dei romani dovette costruirgli il ponte sul fiume di Tustar (oggi Shushtar), la cui larghezza comprendeva mille cubiti'. Cf. Th. Nöldeke, *Tabari*, Leiden, 1897, p. 33, n. 2.

2 *Kephalaia*, Stuttgart, 1940, p. 15, 21-16, 2. Notizie analoghe danno il *Fihrist*, Flügel, *Mani*, p. 85, Jaqubi, l. c., p. 180, 1, Masudi, *Prairies d'or*, II, 164, Albiruni, testo 208, vers. 191.

3 *Patrologia Orient.* IV, 223.

dell'introduzione del Cristianesimo a Merv nel secolo III. I dati sono poco numerosi, nè così particolareggiati come li desidereremmo, ma bastano a mostrare che l'Evangelo aveva fatto la sua comparsa in territori vicini a Merv e con essa in rapporto. Ci fermeremo brevemente sulla regione ad Oriente di Merv e sull'India, l'una e l'altra unita a Merv con una delle principali arterie di commercio.

Nel 'Libro delle leggi delle nazioni' composto in siriaco, si ha un accenno alla diffusione del Cristianesimo in varie regioni, e nel trattare dei costumi dei cristiani, in contrasto con quelli delle genti in mezzo a cui vivevano, si afferma tra l'altro 'le nostre sorelle tra i ghilani e i cushani non fanno adulterio con estranei'.[1] Tale libro viene da alcuni attribuito a Bardesane, da altri al suo discepolo Filippo, se fu composto da Bardesane, l'opera è anteriore al 222, anno della morte di questo, se l'autore ne è il discepolo, essa va posta alcuni decenni dopo. Secondo tale notizia, tra i ghilani, cioè gli abitanti della sponda sud-occidentale del Caspio, e tra i cushani, almeno nella prima metà del secolo III, c'erano cristiani. Con il termine di cushani si indicano gli abitanti del regno fondato da Cadfises I nella prima metà del secolo I, secondo alcuni nel 25, secondo altri nel 40 dopo Cristo. Essi sono gli abitanti della Battriana,[2] il cui centro era a Battra, che con Merv era unita da una arteria principale di commercio. Tale regione, situata ad est di Merv in tempi anteriori costituiva un regno greco, staccatosi dallo impero dei Seleucidi, che durò fino al 128 avanti Cristo, quando venne abbattuto dalle orde degli Yueh-ci, da cui sorsero i cushani. Anche dopo la perdita dell'indipendenza, gli abitanti greci della regione, che prima faceva parte del loro regno, compreso il territorio di Merv, vi rimasero, e la notizia della Cronaca che il primo nucleo di cristiani a Merv fu reclutato tra i greci ritiene tutta la sua verosimiglianza.

Quindi in una regione ad oriente di Merv nel secolo III, al tempo di Sapore I, si trovavano cristiani. Per avere un'altra notizia sul Cristianesimo in quella regione, bisogna aspettare due buoni secoli, e ricorrere ad un autore armeno del secolo V, Elise, il quale riferisce dell'arrivo di cristiani in essa durante la persecuzione di Sapore II.[3]

Se ci rivolgiamo alle regioni confinanti dell'India, non ci fermeremo sulla questione, tanto dibattuta fino ai nostri giorni, del viaggio di san Tommaso apostolo. L'argomento è lontano dal

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[1] W. Cureton, *Spicilegium syriacum*, London, 1885, p. 32 s., cf. anche Fr. Nau, *Patrologia syriaca*, P. I, t. 2, p. 606 s.

[2] Che si tratti degli abitanti della Battriana si rileva da altro passo della stessa opera, Cureton, p. 21.

[3] V. Langlois, *Collection des historiens arméniens*, Paris, 1896, p. 202 b.

nostro soggetto, il quale si limita all'epoca del primo Sapore ed ai tempi ad essa vicini. Inoltre ciò che Eusebio[1] riferisce sul viaggio di Panteno in India circa l'anno 180, è inteso oggi quasi comunemente come riferentesi piuttosto all'Arabia.[2] Gli scrittori ecclesiastici dei primi secoli avevano vaghe notizie geografiche e sotto il nome di India intendevano spesso regioni molto diverse tra di loro: sia l'India stessa, come l'Arabia meridionale e le coste dell'Etiopia. Per uguale ragione, quando leggiamo che Davide, vescovo di Basra, circa il 290-300 lasciò la sua sede e si recò nell'India per evangelizzarla,[3] restiamo nel dubbio di quale India si tratti.

Una notizia sull'esistenza di cristiani nell'India più vicina ai tempi di Sapore I, la quale non sembra essere stata oggetto di studio, ci viene da un'opera araba, di cui dà un largo riassunto Edw. G. Browne.[4] Si afferma in essa che il re Bahram II, che regnò quattro anni dopo Sapore I dal 276 al 293 ebbe disgusto verso la religione di Zardusht a causa del matrimonio fra stretti parenti, in essa consentito. Per questo egli avrebbe fatto venire dalla India maestri cristiani. Gli vennero inviati sette missionari, e il re si sarebbe convertito, ma tenne nascosta la sua fede, essendo stato minacciato di deposizione. Lo scritto arabo abbonda d'inverosimiglianze e anche nel nostro caso ne dà la prova, non è però escluso che contenga qualche nocciolo di verità. Del resto siamo in grado di controllare la notizia con una narrazione che da prova di maggior equilibrio e ci viene dalla Cronaca di Seert.[5] Questa non parla affatto di conversione del re, ma afferma solamente ch'egli conosceva qualche cosa del Cristianesimo, essendo stato educato a Karkha de Joddan,[6] e sapeva anche un pò di siriaco. Era ostile non ai seguaci di Zardusht, ma piuttosto ai manichei, a causa della loro dottrina, contraria al matrimonio,[7] e li perseguitò. Ma siccome questi si camuffavano da cristiani, e d'altra parte i metropoliti e vescovi cristiani si astenevano ugualmente dal matrimonio, il re pensò che le due religioni fossero identiche, e quindi anche i cristiani vennero coinvolti nella persecuzione. Questi se ne lamentarono, e allora il re li interrogò e conosciuta la differenza che esisteva tra la loro religione e

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[1] *Stor. eccl.*, V, 10, 3.

[2] Già Assemani, *Bibliotheca Orient.*, IV, 602 asseriva trattarsi dell'Arabia Felice. Cf. anche Harnack, *Mission und Ausbreitung des Christentums* ed. 4, II p. 703.

[3] *Patrologia Orient.*, IV, 236 (دودي), 292 (داود).

[4] *Nihayatu'l-irab fi Akhbari'l-Furs wa'l-Arab*, in *Journal of the Royal Asiatic Society*, 1900 p. 221.

[5] *Patrologia Orient.* IV, 237 ss.

[6] Assemani, *Bibliotheca Orient.* III, 1, 51.

[7] Se esso (il matrimonio) dice il re, è cattivo e proibito presso di loro, meritano la morte, perchè vogliono aumentare il mondo. Parole analoghe sono attribuite da Albiruni testo p. 208, vers. p. 191, a Bahram I, il quale fece morire Mani: 'Costui (Mani) è sorto per incitare il popolo a distruggere il mondo, sarà necessario cominciare dal distruggere lui, prima che alcuno dei suoi piani possa venire attuato.'

il manicheismo rispetto al matrimonio, non li molestò più Si vedono subito le discrepanze tra la narrazione dell'autore cristiano e quella dell'arabo La Cronaca non dice donde provenivano i cristiani, che furono interrogati dal re, ma la notizia dell'arabo, che il re li abbia fatto venire dall'India, ci guadagna in verosimiglianza Data la confusione, favorita dai manichei, fra le due religioni nello impero persiano, il re avrà preferito di conoscere la dottrina del Cristianesimo riguardo al matrimonio da cristiani abitanti fuori di esso In questo caso bisognerà convenire che cristiani in India esistevano già al tempo di Sapore I

Accenneremo infine ad un noto missionario, Teofilo l'Indiano, di cui l'unico a parlare è Filostorgio La sua missione in India si svolse durante il regno di Costanzo nel 356, quindi parecchio tempo dopo il tempo che ci interessa, si noti però che di lui non si riferisce aver fondato comunità cristiane, ma di averle visitate, esse quindi esistevano prima del suo arrivo e la sua opera si restrinse a riformare alcune esterne pratiche di culto, non conformi ai canoni della chiesa siriaca

Secondo Filostorgio, egli ebbe affidata dall'imperatore Costanzo una missione presso gli Omeriti, gli abitanti dell'Arabia meridionale (Yemen) si trattava di annodare relazioni con il principe di quella gente, di guadagnarne la benevolenza, di ottenere liberta di propaganda religiosa e la facoltà di costruire chiese per quelli che abbracciassero il Cristianesimo Nonostante gli intrighi dei giudei, che si sforzarono d'intralciarne la missione, Teofilo riuscì a convertire al Cristianesimo il principe, il quale a proprie spese fece erigere tre chiese in quella regione Si aggiunge ora che Teofilo, espletata la sua missione, navigò all'isola Dibou, di cui era originario e di là si recò 'nell'altra regione dell'India' Ivi 'riformò molte cose che presso di loro (i cristiani) non erano compiute rettamente' In particolare si fa notare che 'ascoltavano la lettura del Vangelo stando seduti, e compivano altre cose non conformi alla legge divina'[1]

Si tratta dell'India propriamente detta? Ciò sembra risultare chiaramente dal testo stesso, ma taluno ne ha dubitato ed ha affermato che con le parole 'altra regione dell'India' si debba intendere l'Etiopia sul Mar Rosso Ma l'itinerario accennato da Filostorgio esclude tale interpretazione

Dibou corrisponde al sascrito *dvīpa*, pali *dīpa* 'isola', tale nome per indicare un'isola ricorre nell'Oceano Indiano e in altri mari della grande Asia, ma non costa che sia stato usato per qualche isolotto nel Mar Rosso Così si ha ancor oggi l'isola di Diu nell'estremo lembo meridionale della penisola Kathiavar, nella regione del Guzarat nei tempi antichi il termine ricorre anche come secondo membro di un composto per es Jabadiu, Sabadiu, Nagadiba, Trikadiba,

[1] Filostorgio, *Stor Eccl* III, 4-5 ed Bidez, p 34 s, Migne, PG 65, 481-485

Serendib i. e. l'antica Taprobane, odierna Ceylon.[1] Quanto alla ubicazione dell'isola Dibou, i cui abitanti vengono chiamati 'divi' da un scrittore latino, come quelli di Serendib vengono dallo stesso denominati 'serendivi',[2] le opinioni divergono. Alcuni pensano ad un' isola del gruppo delle Maldive, altri all' odierna Diu, altri all'isola di Socotra detta anticamente Dvīpa Sukhādāra. Pensiamo che si tratti di quest'ultima. Filostorgio narra che durante il regno di Costantino, Teofilo in età ancora giovanile era stato mandato come ostaggio ai romani. Ora si può capire che si mandi un ostaggio da un territorio, in cui i romani avevano influenza, e quindi vicino alla Arabia, meno facilmente s'intende se si tratta delle Maldive, e di Diu. Il termine Dibou quindi è l'ipocoristico di Dvīpa Sukhādāra, divenuta in greco Dioscoride. Il viaggio di Teofilo a quest'isola era una prima tappa. Di là egli si recò 'nell'altra regione della India'. Se con questa espressione si volesse indicare l'Etiopia, dovremmo ammettere che Teofilo invece di pigliare la via più breve e comoda attraverso Aden, prima si sarebbe allontanato, recandosi a Socotra, e poi sarebbe ritornato al punto di partenza per raggiungere le coste etiopiche. Per un viaggio dall'Arabia meridionale all'India propriamente detta, Socotra invece era la tappa indicata.

Non ci viene riferito in quale parte di quest'India egli si recò, ma quello che si afferma sul culto ci mostra l'esistenza di comunità cristiane ordinate e dirette da sacerdoti, ciò che suppone una loro esistenza anteriore almeno di qualche decennio alla venuta di Teofilo.[4]

Ritornando al testo di Albiruni, possiamo riassumere ciò che siam venuti dicendo. Il raffronto di esso con la Cronaca di Seert ha mostrato che i 'circa 200 anni dopo C.' debbono intendersi come una data riferentesi all'epoca di Sapore I. Non riesce possibile confermare tale notizia con argomenti diretti non disponendo noi di fonti antiche, peraltro le notizie che abbiamo delle condizioni in cui vivevano i Cristiani a quel tempo nell'impero persiano e dello sviluppo dell'apostolato cristiano non solo non contrastano con l'affermazioni di Albiruni, ma depongono in suo favore.

Roma, 6 dicembre 1947

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[1] Cf. G. E. Gerini, *Researches on Ptolemy's Geography of Eastern Asia*, London, 1909, p. 465.

[2] Ammiano Marcellino, XXII, c. 7.

[3] L. c.

[4] Cf. A. E. Medlycott, *India and the Apostel Thomas, an inquiry*, 1905, p. 198, A. Mingana, *The early Spread of Christianity in India*, in *Bulletin of the John Rylands Library* 10 (1926) 458.

ON SOME OF BĪRŪNĪ'S INFORMANTS

By

PROF V MINORSKY,

Cambridge

In his praiseworthy edition and translation of Bīrūnī's *India* Prof E Sachau has analyzed the whole range of Indian and Greek sources [1] which went into the preparation of this monumental work Similar methods have to be applied to all the works of the 'Iranian Eratosthenes' [2] Only then shall we be able to explore the foundations of his judgments and appreciate the flashes of his genius in drawing his own conclusions from the facts

To this end I wish to offer my suggestions regarding some items in Bīrūnī's *al-Qānūn al-Mas'ūdī* and *Tahdīd al-amākin* [3]

I In *al-Qānūn al-Mas'ūdī* Bīrūnī quotes a number of points relating to the Far East which are found in the same arrangement only in one other known source, namely in Marvazi's *Tabā'i' al-hayawān* [4]

1st Clime	No	57	سرعوز
2nd	,,	125	تنا
,,	,,	124	اوتكين
3rd	,,	293	تكسين
,	,,	294	حابون سين
5th	,,	571	توسمت
,,	,,	573	سولمن

In Marvazi these places are arranged in itineraries, with distances between them indicated in days of travelling In Bīrūnī they are quoted separately according to their longitudes and latitudes

Immediately after the itineraries connecting the lands of Islam with Mongolia, China and Manchuria, Marvazi gives an exceptionally

[1] See now two additional quotations from Homer identified by Prof Kratchkovsky, *Izv Akad nauk U S S R*, 1945 IV No 5 pp 2[illegible]-5

[2] As Bīrūnī is called by J Marquart, *Das Reich Zābul* p 248

[3] The texts are found reproduced in A Z Validi Togan s *Biruni s Picture of the World*, Memoirs of the Arch Survey of India No 53, pp 10-53 and 54 68

[4] Minorsky, *Sharaf al-zamān Tāhir Marvazi on China the Turks and India*, 1942

valuable account of an embassy of the rulers of Qitāy and Yughur which visited the court of Sultan Mahmud *circa* 418/1027. It followed as a natural corollary that the description of the unusual roads depended on the reports of the said envoys. The ambassador of Qitāy came undoubtedly on behalf of the Emperor Shêng Tsung (983–1031) of the Liao dynasty[1] which had conquered Manchuria and Northern China and formed a powerful State in A.D. 937–1125. The other envoy represented some Uyghur ruler, probably the king of the Sarī-Uyghurs of Kan-su.[2]

Sharaf al-zamān Marvazi was only a compiler and the last date found in his work is 514/1120. Bīrūnī died in 440/1048 and it would have been quite possible for Marvazi to use his works, but the fact is that no *detailed* report on the two embasies has been found in any of the known writings of Bīrūnī. Thus we have to postulate that Marvazi used some official record of the reception and interrogation of the ambassadors in Ghazna.[3]

As the embassy came to Ghazna in A.D. 1027 and the *Qānūn al-Mas'ūdī* was compiled shortly after 421/1030, it was also safe to assume that Bīrūnī's additional place-names in the Far East were in some way connected with the passage of the rare guests. Great was my pleasure when, in another of Bīrūnī's works,[4] I found a *direct* indication that he 'interrogated the ambassadors from the Qitāy-khan'. He asked them about the value they attached to *khutū*,[5] but he could not have missed the opportunity of completing his knowledge of the more important problems of Far Eastern geography. Only with his usual leaning to mathematical accuracy he tried to express the ambassadors' itineraries (as still available in Marvazi) in terms of astronomical co-ordinates.[6]

II. Another name which percolated into Islamic geography through Bīrūnī is *Waranj/Warank*, by which name Norsemen were known in ancient Russia and Byzantium.[7] In his *Tahdīd*

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1 *Qitāy*, in Chinese *Kitan*, was the name of the people led by this dynasty.

2 In A.D. 840 the Uyghurs were driven from the territory they occupied in the present-day Mongolia and retreated to the West, where by the beginning of the tenth century they formed two kingdoms in the Chinese province Kan-su and in Eastern T'an-shan (Turfan).

3 It has always been a habit in the East to interrogate ambassadors on the countries they represented.

4 *Kitāb al-jamāhir*, ed. Krenkow, p. 83, and *Saydana* in *Bīrūnī*'s *Picture*, p. 118.

5 A still mysterious product described as the horn of some animal. Bīrūnī himself explains it as 'the frontal bone of a bull in the country of Khirkhiz'. See *Saydana*, in *Bīrūnī's Picture*, p. 118, cf. *Der Islam*, II, 1911, 345–58.

6 The complete title of the book *Tahdīd nihāyāt al-amākin fī taṣḥīḥ masāfāt al-masākin* clearly indicates Bīrūnī's intention to connect astronomical co-ordinates with the finding out of distances. In the *Qānūn* he used this method the other way round.

7 Slavonic *vareng/varag*, Greek *Barang-os*.

al-amākin[1] he speaks of the sea which turns away (*mun'atif*) from the Circumambient Ocean 'to the north of the Saqāliba (Slavs)'[2] and states that 'it is called the Sea of the Varang (*Bahr Waranj*) because this nation lives on its coast.' Opposite it lies a region where snow and ice abound, though cold is not excessive (Scandinavia?).

'There are even some of those (Varangs) who on their fishing and predatory expeditions during the summer stubbornly (navigate) that sea and sail on in the direction of the North Pole up to the place where at the summer solstice the sun rotates above the earth. (The sailor) sees it and boasts among his people of having reached a place where there is no night.' In Bīrūnī's biography found in Yāqūt's *Irshād al-arīb* (VI, 310) an anecdote is quoted about 'an ambassador from the extreme limits of the Turks' who told Sultan Mahmūd exactly the same story, namely that 'beyond the sea, in the direction of the *Southern*[3] Pole' he saw the sun rotate above the earth, so that there was no night. When Sultan Mahmūd got angry and accused him of heresy, Abū Nasr ibn Mishkān[4] calmed his master by pointing to the artlessness of the Turks. Then the Sultan questioned Abū Rayhān Bīrūnī and the latter began to explain the matter briefly and convincingly, and finally the question was settled. This story, which is possibly derived from the *Maqāmāt* of Abū Nasr ibn Mishkān (now lost), is important in that it indicates the presence of Bīrūnī at the audience.

Who could this ambassador have been? By a most happy coincidence the author of the *History of Bayhaq*[5] reports that in 415/1024 the padishah of the (Volga) Bulghārs dreamt that he should make an offering to the mosque of Sabzavar and Khosraugird. To this offering he joined wonderful presents for the 'padishah of Khorasan', i.e., certainly for Sultan Mahmūd.[6] Yāqūt's story makes it certain that, just as in the case of the Qitāy embassy, Bīrūnī fully utilized this chance of completing his information on the Polar regions with which the Volga Bulghārs entertained active trade. It may be added that the *Tahdīd al-amākin* was composed in 1025, i.e., within one year of the coming of his Bulghar ambassador.

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1 *Bīrūnī's* Picture, p. 63.

2 Probably the Baltic still confused with the White Sea, etc. The text is rather involved. See A. Z. Validi's translation in ZDMG 1936, 90, 39, and my commentary in *Marvazi*, pp. 115-6.

3 All the parallels and the general sense leave no doubt whatever that we must read *Northern* instead of *Southern*.

4 Head of the Correspondence Department.

5 Abul-Hasan Ali Bayhaqi known as Ibn Funduq wrote his history in 563/1164; see p. 63 of the Tehran edition (1317/1938).

6 According to M. Nazim, *Sultān Mahmūd*, p. 53, in September 1024 Mahmūd was in Balkh.

III As a further illustration of Bīrūnī's eagerness to acquire knowledge by interrogating travellers one might quote his own statement in the *Saydana* as to how he obtained Greek names of plants from a Greek who happened to visit Khwārazm [1]

One knows Bīrūnī's emphatic utterance on his attachment to the Arabic language and culture [2] This does not alter the fact that the characteristic and unbounded curiosity of Bīrūnī [3] must have been stimulated not by any exclusiveness of his sympathies but rather by the variety of his experience and environment He was born on the borderland of the old world of Iranian culture and the steppes teeming with Turkish nomads At the court of Qābūs ibn Vushmagīr he could still observe numerous remains of old pre-Islamic times which survived in the Caspian region, in Ghazna and India he witnessed the astonishing contrasts of the world of Indian culture Bīrūnī may have spoken disparagingly of his native provincial tongue,[4] but it was a sister of Soghdian whose cultural legacy is coming to light only now We may yet hear of a literature which existed in the Khwārazmian language which has been deciphered by professors W Henning (London) and A Freiman (Leningrad) Khwārazm was an old cultural land Bīrūnī himself compiled a *History of Khwārazm* and has drawn up a long list of the ancient Khwārazmian kings [5] some of whose names have been retrieved from the local coins

When thirty-seven years ago I visited Bīrūnī's native country, I could not help admiring its ancient system of irrigation canals The imposing ruins which Professor S P Tolstov has dicovered amid the sands now stretching around the Khwārazm oasis are other vestiges of its former glories [6]

These multifarious impressions and influences must have presided over the growth of Bīrūnī's genius

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[1] See Meyerhoff, *Das Vorwort zur Drogenkunde des Bīrūnī*, 1932, p 42

[2] *L c*, p 40

[3] *L c*, p 42, Arabic text, 14 *qad hakaytu fī gharīzatī mundhu hadāthatī bi-farṭ al-hirṣ 'alā iqtinā al-ma'ārif*

[4] *L c*, 39 40 Arabic text 12-13 'And I judge by myself my native language is such that, were Science treasured in it, one would feel as astonished as (at finding) a camel in a roof-gutter or a giraffe in a drove of noble steeds Then I switched to Arabic and Persian but in both of them I (feel like) an embarrassed outsider (*dakhīl wa mutakallif*) '

[5] Now lost and known only through quotations, see Barthold, *Turkestan* 20 See also E Sachau, *Zur Geschichte von Khwārazm*, *Sitz W A W* 1873, LXXIII, 471–506

[6] See now a detailed description in S P Tolstov, *In the footsteps of the Khwarazmian civilization*, 1948 (in Russian) During his latest expedition to Khwarazm (1948) Prof Tolstov discovered 81 written documents in old-Khwarazmian

(Dr Mohammad MOIN)

بعض فواید لغوی

کتاب

الجماهر بیرونی[*]

از دکتر محمد معین

استاد ادبیات فارسی در دانشگاه تهران

کتاب الجماهر فی معرفة الجواهر[1] ابو ریحان محمد بن احمد بیرونی چنانکه از عنوان آن پیداست، در موضوع انواع جواهر و معادن تألیف شده است ولی ضمناً مشتمل بر فواید لغوی و تاریخی بسیار است. در این مقاله منظور ذکر برخی از فواید لغوی این کتاب ارجمند است[2] *

۱ — آذرشست — در جماهر آمده[3] «فی ذکر اخبار البادزهر الاجوف المشتمل علی مخاط السلطان یوجد من حوله ما وبه و یعمل من غزله شُسْتَکات[4] و هی التی کانت الاکاسره تسمیها آذَرْشُسْت و فی اسم تنبیه علی المعمول من غیره فانّ النّار تحرقها» *

آذرشست مرکب است از دو کلمهٔ: آذر، که با آتش از یکریشه و در اوستا آتر ātar و آترش ātarsh و در پهلوی آتور ātur، اتر atar و آتش ātash و در

(*) نویسندهٔ مقاله رساله‌ای بعنوان «شاهان کیانی و هخامنشی در آثار الباقیه» بیرونی تألیف کرده است که در مجلهٔ آموزش و پرورش (نشریهٔ وزارت فرهنگ ایران) سال یازدهم شماره ۸ و ۹ و ۱۰ چاپ شده است

(۱) تألیف کتاب با عهد شباب سلطان ابو الفتح مودود بن مسعود بن محمود (۴۳۲—۴۴۰) مقارن بوده است (صفحهٔ ۳۱ الجماهر)

(۲) این کتاب در هند، در مطبعهٔ جمعیة دائرة المعارف العثمانیهٔ حیدرآباد دکن سال ۱۳۵۵ چاپ شده

(۳) الجماهر صفحهٔ ۲۱

(۴) رک. عنوان «شستکات» در همین مقاله

پارسی آدر ـ آدر ـ آسں ـ آدسں و سں و در لہجۂ عامیانۂ ‌تہرانی و لہجۂ شیرازی آتیس و در لہجۂ دزفولی سں آمده است[1] *

حرفِ دوم سَرحَم (سُستَه) است از مصدر سُستن از مصدر اوستائی snā که در پارسی بصورت سنا ـ اسنا ـ سُستں و مشتقات آنها در آمده[2] *

لغت مرکب آدر سست بمعنی سُستۀ در آتش و (مغسول بالنار) عربی است[3] ـ این لغت را فرهنگ‌نویسان بخطا (آدر ست) و (آدر سپ) یاد کرده[4] بمعنی نام فرشتۀ موکل آتش که پیوسته در آتش است و نیز آنرا بمعنی سمندر آورده اند ـ منوچهری گوید.

در سود سرحم و زحر و در سود بی‌برس و سم
همچو آدر ست با آتش[5] همچو مرغابی بجوی

و در مجمل التواریخ و القصص آمده[6] "[و خسرو پرویز را بود] دستارچۀ آدر سست و آن از موی سمندر بافته بود،، *

آقای دهخدا احتمال داده اند که مراد از موی سمندر حجر الفتیله یعنی پنبۀ کوهی باشد و بعد بمداند که آدر ست (آدر سُست) نیز بمعنی حجر الفتیله باشد[7] ـ بنظر بعبارت بیرونی شکی نمی‌ماند که صحیح این کلمه همان آدر سست است که در کتابت بخط عربی تحریف شده است *

۲ — بهرج ـ در جماهر آمده[8] : "و فی حدیث الحجاج انه کتب الی بعض عمّاله، ان ابعث الینا بالحشبر[9] اللؤلؤ ای الجراب بهرج به و البهرج عند من عرّبه من

(۱) رجوع شود مزدیسنا و تاثیر آن در ادبیات پارسی تالیف نگارنده صفحه ۲۷۷،

(۲) Bartholomae, *Altiranisches Worterbuch*

(۳) جماهر صفحۀ ۲۱ حاشیۀ ۲ (۴) رک برهان قاطع

(۵) چنین است در اصل و آقای دهخدا چنین تصحیح کرده اند همچو آدر شست با آتش

(۶) مصحح آقای بهار صفحۀ ۸۱

(۷) لغت نامه دهخدا، مادۀ (آدر شب) ـ آدر شست در برهان قاطع بخطا آدر شب (با بای فارسی) آمده

(۸) صفحۀ ۱۵۷-۱۵۸ (۹) ترکش ـ تیردان

الفارسية هو الردئ و اللفظة فى الاصل منقولة من الهندية فانّ الجيد بهله بالباء و الردئ بهله[1] و كذلك بالفارسية بهله بالباء التى تعرب بالفاء حتى ان افصل لُغاتهم هى المهلونة نسبة الى الجوده - و يقولون انّ الردئ من الدراهم بهره[2] و للطريق العادل عن المحجة كذلك - و لكن هذا الخبر لما كان بين العرب و كان البهرج عندهم هو الردئ و كيف يحمل الى الحجاج ما يرد و يسترذل و كذلك قال ابو محمد القيسى، احسبه خراباً بهرج به عن الطريق المسلوك اى عدل و اخذ به الطريق البهرج خوفاً ان يحدث به من الغائش حادثة قطع او من العساكر تعرض بغاة العسكر و قد رسم الحجاج لحامله اخفاءه و الاحتياط فيه ففعل ذلك،، *

مؤلف لسان العرب نقل از اين قسم گويد: ''احسبه بخراب اؤلؤ بهرج، اى عدل به عن الطريق المسلوك خوفاً من العسار و اللفظة معرّبة و قيل هى كلمة هندية اصلها نبهلة و هو الردئ فنقلت الى الفارسية فقيل نبهره ثم عرّب بهرج،،[2] *

در مقدّمة الادب زمخشرى امده[3]. ''بهرج: الدرهم الذى فضّته غالبة،،[5]

در كتاب المعرب جواليقى آمده[6] ''البهرج الدرهم المُبطل السّكّة و البهرج: التعريج من الاستواء الى غير الاستواء و البهرج. الشئ المُباح - يقال. تَهَرَّجَ دَمَه اذا اهدره،، ازهرى گفته. ''بهرج،، عربى محض نيست و اصل آن ''نبهرج،، است و آن درهم‌هاى پست است و گويى در اصل نباره بود نس گفته اند نبهرج و بهرج و جمع آن دراهم بهرجة و نبهرجة و بهرجات و نبهرجات و بهارج - طنّان گويد. گفته اند: درهم مُبهرج و نَبَهْرَج و بَهْرَج و شاعر گفته.

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(۱) در اصل مهله و خطاست (۲) نسخه بدل نبهره - نيره و هم در خطاست

(۳) الجماهر صفحه ۱۵۸ حاشيه (۴) چاپ لستا سال ۱۸۴۳ صفحة ۶۵ سطر ۳۳

(۵) ناشر مقدمه الادب در فهرست لغات بهرج را چنين معنى كرده

drachma argento et pondere praestantior

( ) چاپ مصر صفحة ۳۹

قالت سلمی قولة نحرجا   یا شیخ لا بد لنا ان نحججا

قد حج هذا العام من تحرجا   فاشتغ لنا جمال صدق فالنجا

لا نعطه زیفاً و لا نبهرجا

و ابن الاعرابی گفته:

ان هویاً قل ما تحرجا   اعطانی الناقص و النبهرجا

و الزیف حتی لم تدع لی مخرجا   اذا رأی باب حرام همّلجا

و ابو عمرو گفته: درهم نبهرج و دراهم نبهرج. گوید: و النبهرج، المعدول به عن جهته، پس گوید: نبهرج التريد، اذا عدل عن الطریق. و نیز گوید: النبهرج، الدرهم المضروب فی غیر دار السلطان[1]. دزی Dozy در ذیل قوامیس عربی آرد:

نبهرج. falsifier, altérer, être de mauvais aloi, être altéré

نبهرج: un métal altéré, de mauvais aloi

نبهرجة: concetti, pensées brillantes, mais fausses

کلمهٔ (نبهره) در زبان پارسی استعمال شده است. اسدی در لغت فرس، ذیل پسنز د[2]: "چیزی باشد که بجای درم رود. رودکی گوید:

ه فضل میر ابو الفضل بر همه ملکان   چه فضل گوهر و یاقوت بر نبهره پشیز"

نظامی گوید:

شناسنده گر نیست شوریده مغز   نبهره شناسد ز دینار نغز[2]

ی اسدی خود لغت "نبهره" یا "بهره" را در لغت نامهٔ خویش ضبط نکرده است *

(۱) المعرب صفحهٔ ۴۹-۵۰   (۲) مصحح آقای اقبال صفحهٔ ۱۸۱

(۲) بمعنی زر و سیم و قلب و ناسره رجوع شود گنجینهٔ گنجوی وحید صفحهٔ ۱۵۳

در برهان قاطع آمده: ''بهره — بفتح اول و ثانی و سکون های هوز و رای قرشت مفتوح، بمعنی فلس و ناسره باشد عموماً و سیم قلب را گویند خصوصاً و بمعنی دون و فرومایه هم آمده است و بمعنی اول نابهره باشد که بزرگ و عظیم است و بمعنی پوسیده و پنهان هم گفته اند،، ـ این کلمه مرکب است از (ن) سابقهٔ نفی و (بهره) که در زبان پارسی فقط بمعنی حصّه و نصیب و حظّ و قسمت[1] آمده ـ ممکن است حدس زد که (بهره) در اینجا مبدّل (باره) باشد چه تبدیل ب و پ و الف و ه معتاد است چنانکه در پاد افراه و باد افراه و بهلد و بارند ـ و رسم الخط آن در پهلوی بهر دو وجه بارک و بهرک خوانده میشود. (بارک و بارگ) در پهلوی بمعنی پول و (بارک ستانه) بمعنی رشوه‌گیری است و در پارسی هم باره بمعنی رشوت[2] و اناوه و رشوه‌ای که قاضی را دهند[2] آمده: عنصری گوید:

هر آنجا که باره شد از در درون شود استواری ز روزن برون

سوزنی راست.

قاضی دعویٔ مرا نشود تا بزرم نبس زمن باره . . .

و نیز بمعنی مُزد و جعل[3] و همچنین بمعنی مسکوک و پول و نقد و بها و ثمن استعمال شده ـ فرخی گوید:

پر پارهٔ زر گردد جائی که جوری بی پُر چشمهٔ خون گردد جائی که کسی کین

امروز جز خُرد ترین پول مسیر و با نکلس تا سنتس شاهان را که جهل یک فروشن است گویند[5] بنابر آنچه گفته شد بعید نیست که از معانی (پارگ) پهلوی و پارهٔ پارسی وجه رائج و سیم مسکوک متداول بوده که بعدها نماسب ـ کر لازم و ارادهٔ ملزوم بر موت اطلاق شده و بارک ه باره (= با پارَگ ـ با باره) بمعنی وجه غیر رائج و پول قلب بوده و همین کلمه، بیهرگ و نبهره نیز بلفظ مسده و معرّب نبهرگ،

(۱) برهان قاطع

(۲) برهان و صحاح الفرس و زمخشری و منتهی الارب (۳) لغت اوبهی

(۴) در منتهی الارب: جاعله بمعنی باره دادن آمده

(۵) نقل از لغت نامهٔ کبیر آقای علی اکبر دهخدا

تَتَهْرَج گردید و گاه نیز بقاعدهٔ تعریب حرف اول را حذف کرده بهرج گفتند چنانکه نرمَا۔ ورد را رماورد[1] و بیمارستان (یاء آن مجهول است) را مارستان خواندند[2] و بعدها از اسم بهرج فعل ساخته تَبَهْرَج گفتند *

۳ — خود خروه ـ در جماهر صفحهٔ ۱۹۱ - ۱۹۲ آمده: "و جنس[3] یسمی خروهك و عرّب بالخراهك و هو نسبة لاصل البسّد تقلبوه الدیك کما سمّته نوع من ستان افروز عریض مسنّج و سمّی[4] خود خروه[*] و اظنه انا ذلك الاصل الموسوم بالمرجان فان مرجان قریب من اسم الطیور الفارسیة"[6] *

امّا خروهک که معرّب آن خراهک آمده مرکب است از (خروه) که لغتی است در خروس ـ عنصری گوید:

شب از حملهٔ روز گردد ستوه شود پرّ زاغش چو پرّ خروه

و نظامی گوید:

خروه غنوده فرو کوفت بال دهل زن زند بر تبیره دوال

و ابو علی صاحبی گوید:

ای خواجهٔ [ما] چرا شدستی زگروه خوبان که زدند طرّه‌ها خود خروه

و تبدیل سین به ها در زبانهای ایرانی بسیار رایج است چنانکه در آماس و پلاس پارسی، آماه و پلاه هم آمده و روپاس و آکاس و پاسراس و راس پهلوی در پارسی روباه و آگاه و بادا فراه و راه شده و در زبانهای سانسکریت و اوستا و پارسی باستان نیز همین تبدیل

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(۱) المعرّب جوالیقی صفحهٔ ۱۴۳

(۲) همان کتاب صفحهٔ ۳۱۰ و تفسیر الالفاظ الدخیلة فی اللغة العربیه (۳) من البسّد

(۴) در اصل یس

(*) این صورت مصحح استاد علامه آقای دهخدا است و در اصل (حول حروه) آمده و محشی جاهر در ذیل نوشته است «ای الدیک الصغیر یعنی مرغان نعنی الطیور» و حول در پارسی پرنده‌ایست کوچکتر از گنجشک (مرغان)

(۶) یعنی مرجان و مرغان در تلفظ و کتابت نزدیک بهمند

صورت گرفته است چنانکه اسوره Asura (نام خدا) و سپته (هفت) و سندو (هند) سانسکریت در اوستا و پارسی باستان به اهوره Ahura، هپته hapta و هیندو Hindu تبدیل شده و خروه سپاهی در فرهنگها بمعنی (تاج خروس) هم آمده است[1] اما خروس و مبدّلات آن خرور و خروه و خروح و خروج و خرو (در خوسساری) وکروس و اروز از مصدر خرئوس xraos (=xrus) اوستائی است بمعنی خروشیدن و خود کلمهٔ خروس و خروسیدن با این ریشهٔ اوستائی از یک نژاد است[2] - کاف آخر (خروهک) پسوند تصغیر است - همچنانکه بیرونی تذکر داده "خروهک" بمعنی مرجان است و "خود خروه" که بیرونی و فرهنگ نویسان آنرا با (بستان افروز) تطبیق کرده اند[3] همانست که امروز تاج خروس خوانند و آن درست لغةً و معناً برابر با "خود خروه" است و در فرهنگها "خود خروج" نیز ضبط کرده اند[4] - کلمهٔ (خُود) در اوستا خئوده xaoδa آمده بمعنی سرپوش، آنچه که سر را بپوشاند و در حقیقت همان خُود پارسی - این کلمه در پارسی باستان ضمن کلمهٔ مرکب تیگره خوده Tigra-Xauda که صفت طایفه‌ای از سکه‌ها (Sakas) آمده بمعنی دارندهٔ خود تیز است[5] - لغت خروهه با خروسک و خروسه (=vāgīna) و بسیاری از لغتهای دیگر بمناسبت رنگ و شکل تاج خروس اطلاق شده[6]. اما گل بوستان افروز یا تاج خروس همان amaranthus cruenti است[6] که نوعی از آن را فرانسه Crète-de-coq گویند[7] و آن لغةً بمعنی تاج خروس است *

۳ — روزنامچه - در صفحهٔ ۲۶۰ الجماهر، از قول ناخدای کسی گوید: "و کتبها[8] فی الروزنامج باسمه"[9] و روزنامج معرب (روز نامگ) پهلوی و آن

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(۱) برهان قاطع (۲) فرهنگ ایران باستان - پور داود صفحهٔ ۳۱۵ - ۳۱۶

(۳) خود خروه بر وزن و معنی خود خروس است که تاج و معمر خروس و گل بستان افروز باشد (برهان قاطع)

(۴) برهان قاطع (۵) Bartholomæ, Air Wb

(۶) داروئامه، آقای دکتر احمد پارسا صفحهٔ ۸، کاربیوسکی amaranthe فرانسه را به بوستان افروز ترجمه کرده و صحیح است (فرهنگ فرانسه فارسی آقای دهخدا)

(۷) فرهنگ فرانسه فارسی آقای دهخدا (۸) مصلهٔ سرب

(۹) باسم شیخی که مطلب حاجی رد او آمده بود

مرکب است از روز و نامک بمعنی نامه و کتاب و دفتر - کلمهٔ روزنامجه در سده‌های نخستین اسلامی مستعمل بوده است - ثعالبی در یتیمة الدهر آورده[۱] : "ما اُخرج من کتاب الروزنامجه للصاحب[۲] الی ابن العمید ممّا یتعلق بمُلَح اخبار المهلّبی" و نیز در جای دیگر شرحی از کتاب روزنامجهٔ صاحب بن عباد میآورد باین عنوان: "فصل من کتاب الروزنامجه ایضاً" و یاقوت حموی در معجم الادباء نیز شرحی از "کتاب الروزنامجه لابی القسم اسمعیل بن عباد" آورده است[۳] و از همهٔ اینها صریحاً معلوم میشود که روزنامه در آن اوقات بمعنی کتاب شرح گزارش روزانه و یادداشت وقایع هر روزه که اکنون بزبان فرانسه journal میگویند بوده - همچنین یاقوت در معجم الادباء از قول عبد الله بن عبد المجید بن شیران نقل میکند که او نقل کرد که محمد بن احمد مفجع پیش پدر من میآمد و من طفل بودم و او را میدیدم در اهواز و او بپدرم مراسله مینوشت و مدح پدرم را هم شعر کرده و من این مدح را جمع کرده بودم ولی در موقع دخول ابن ابی لیلی باهواز گُم شد و روزنامه‌های آنها بغارت رفت[۴] - وفات عبد المجید بن شیران و مُفجع هر دو در سنهٔ ۳۲۷ واقع شده - این اصطلاح ظاهراً بعدها در ایران بهمین معنی باقی‌مانده و در قرون اخیره بمعنی راپورتهای وقایع نگاران دولتی که از ولایات اخبار جاریه را بدولت مینوشتند و بمعنی مطبوعات یومیه و هفتگی اطلاق شد[۵]. قول ابو ریحان نیز مؤید معنی اولی کلمه است *

* دزی در ذیل قوامیس عرب (روزنامه) را بمعنی calendrier فرانسه گرفته است *

۵ — شستکان - در عبارتی که از قول بیرونی در عنوان (آذر جشن) نقل کردیم کلمهٔ (شُستَکان) آمده و آن جمع شستکه معرب شستک shostak پهلوی و شسته پارسی و بمعنی مغسول عربی است از مصدر شستن که آنهم از ریشهٔ سنا snā مصدر اوستائی

(۱) چاپ دمشق جلد دوم صفحهٔ ۱۰-۱۱ (۲) صاحب بن عباد

(۳) چاپ مارگلیوث جلد ۵ صفحهٔ ۳۴۰ (۴) همان کتاب جلد ۶ صفحهٔ ۳۳۲

(۵) نقل از مقالهٔ (روزنامه نگاری در ایران) شمارهٔ ۶ از مجله کاوه دورهٔ دوم بقلم آقا تقی زاده

است بمعنی شُس و کلاب شا و آشنا نیز از همین ریشه است[1] این کلمه اصطلاحاً نوعی جامهٔ سُور اطلاق میشده است[2] *

۶ — کدخداهیه ـ در صفحهٔ ۱۱۱ الجماهر آمده: "و اما حص العذاری لمراعهن من مراعاه الکدخداهیة،، محشی در بارهٔ کلمهٔ اخیر نوشته: "هذه لفظة فارسیة تذکر فی الموالید و احکام النجوم،،[3] *

این کلمهٔ پارسی (بمعنی اخص) نیست و پهلوی است و بلفظ صحیح آن کدخداهیه kad-*xoδδāhīh* یا کتک خوادایه katak-xᵛatāyīh است مرکب از کد، که از ریشهٔ کته kata اوستائی آمده است و این واژه نیز از مصدر کن kan بمعنی کندن مشتق است[4] ـ از همین ریشه است واژه‌های (خانه) و (کدک پهلوی = کده پارسی = خندق معرب) و کنکه (شهر معروف هند)[5] *

در اوستا کته بمعانی ذیل آمده: اطاق، مخزن، سرداب، محل حفظ لاشه ـ همین کلمه در پهلوی به کتک katak تبدیل شده[6] و کده در پارسی از ادات مکان است و در فرهنگها آنرا بمعنی خانه دانسته اند[7] جزء دوم نیز مرکب است از خوتای xᵛatāy پهلوی و ایه ih ـ خوتای از کلمهٔ (خوا ذَ) مشتق شده است یعنی از خود آورنده، از خود برخاسته[8] جزء اخیر (ایه) در پهلوی علامت نسبت است و آن در پارسی به (ای) تبدیل شده است ـ کدخدا لغةً بمعنی صاحب و شهر و بزرگتر خانه و خانه خدا است ـ حافظ:

جلوه مفروش بمن ای ملک الحاج که تو خانه می‌بینی و من خانه خدا می‌بینم

و آن برابر کدبانو است که بزن مهتر خانه اطلاق شود ـ و امروز کدخدا بمعنی مهتر و رئیس سفید ده (مرادف دهخدا) استعمال شود ـ اما کدخداهیه که در پارسی

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(۱) *Air Wb* (۲) الجماهر صفحه ۱۲۱ ح ۲ (۳) صفحه ۱۱۱ ح

(۴) Grundriss der Neupersische Etymologie von P Horn Strass 1893

(۵) مرکب از Kalik نام رب النوع و Kata بمعنی سرای، خانه

(۶) *Air Wb* s 432 (۷) برهان قاطع

(۸) *Air Wb*, Grund der Neupers, Etudes Iraniennes par Darmesteter I p 7 و یشتها، پور داود ج ۱ صفحه ۳۲

کدخدائی مشود لغةً بمعنی (فی) مهتری خانه و بعبارت دیگر فن تدبیر منزل و ادارهٔ خانه است[1] *

۷ — مشت افشار - در صفحهٔ ۲۳۴ جماهر آمده: ''و اعلب الظن فی الذهب المشتفشار[2] انه للسبه و انه کان فی ایام الفرس محظوراً علی العامة من جهة الساسة و کان للملوك خاصة،، *

و سر بیرونی پس از چند سطر (صفحهٔ ۲۳۵) آرد: ''و قال حمزه ان سبة[3] کانت من کره من ذهب محلول یعلبها الملوك و لعابها کما نقلب الآن اکر اللخالخ[4] و کان اذا قبض علیها اسال الذهب من بین اصابعه کانه عصره فانعصر و المستفسار[5] هو الشراب المعصور [بالیدلا(م)] بالارحل - [و السراب المعصور بالارحل[6]] للعوام،،[7] *

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(۱) رجوع شود بنفایس الفنون تألیف محمد بن محمود آملی قسم دوم مقالهٔ اولی فن دوم (در علم تدبیر منازل)

(۲) در متن - المستفشار - در حاشیه المستشفار متن تصحیح آقای دهخداست

(۳) مصحح الجماهر (صفحهٔ ۲۳۵ ح) نسخه بدلهای این کلمه را (سسه) و (سه) (بدون نقطه) و (سه) آورده و نوشته است «صحیح این کلمه را نیافتم» - و (سسه بدین صورت در کتب لغت مضبوط نیست و فقط در ذیل قوامیس عربی تألیف دُزی آمده «سبة» قسمی از کاجال (میز) دارای سه پایه» و چون معنی شک کند و این معنی بر فرض صحت دراینجا مُراد نیست و ظاهراً (سسه) صحیح است و آن مرکّب است از سپ پارسی (رک تفسیر الالفاظ الدخیله فی اللغة العربیة، سب) و «، وحدت» پادشاهان ساسانی عادت داشتند میوه‌های مصنوع مانند ترنج و بهی از زر و سیم ساخته در دست گیرند

(۴) جمع لخلخه و آن خلطی است از مشک و عنبر و کافور و مانند آن

(۵) در اصل نیز المستفشار مصحح جماهر در اینجا نوشته است «کلمهٔ فارسیه معدوله من مست و فشار ای عصار السکر» و از فحوای عبارت متن پیداست که این تعبیر درست نیست و مست (در صورتیکه در متن اصلی هم با سین آمده باشد) معرّب مُشت است و مُشت افشار همانست که امروز دست افشار گویند ولی باید دانست که معرّب مشت فارسی نیز مشت (با شین معجمه) است هم بمعنی قبضه و هم بمعنی (مشت آب) و سکهٔ مَرو گفته اند کُلُّ مُشتٍ بِستُّ ستات (ذیل قوامیس عربی، دزی)

(۶) تصحیح علّامه علی اکبر دهخدا، مؤلف لغت نامهٔ کبیر

(۷) سپس ابو ریحان در بارهٔ امکان سیلان طلا و ذکر آن در سِیَر ملوک از توریة و هدیه سیرام پادشاه صور بسلیمان سخن رانده است، الجماهر صفحهٔ ۲۳۵

در مجمل التواریخ و القصص آمده[1] : "و [خسرو پرویز را بود] زر مشت افشار که بر آن مُهر نهادی و برسان موم بود". ـ کریستنسن در تاریخ ایران در زمان ساسانیان آورده[2] : "از عجایب و نفایس دستگاه پرویز ... قطعهٔ زری بوزن ۲۰۰ مثقال (مشت افشار) بود که چون موم نرم بود و میتوانستند آنرا باشکال مختلف در آورند"[3] . در فرهنگ جهانگیری[4] آمده : زر مشت افشار گویند که قدری زر بوده در خزانهٔ خسرو پرویز مانند موم نرم که هر صورتی از آن خواستندی (کردندی) بی‌آتش ـ حکیم سوزنی گفته : * بیت *

زرّ مشت افشار بودی بوسهٔ او را بها
سِلک آورد و سرا پر زرّ مشت افشار شد"[5]

در برهان قاطع آمده :"مشت افشار بضم اول : ۱) طلای دست افشار باشد و آن در خزینهٔ خسرو پرویز بود ـ گویند مانند موم نرم شدی و هر صورتی که از آن خواستندی ساختندی ۲) شرابی[6] را نیز گویند که از انگور بیفشر رسانیده باشند و آنرا باصطلاح شرابخواران شراب جهودی گویند و بلغت اهل شام مِشطار خوانند و بحذف همزه[7] آمده است". بیت ذیل از خاقانی، از قصیدهٔ ایوان مدائن نیز مؤید این اقوال است :

کسری و ترنج زر، پرویز و به زرّین   برباد شده یکسر، با خاک شده یکسان

و (دست افشار) را نیز بهمین معانی آورده اند ـ در فرهنگ آنندراج آمده : "طلای دست افشار مشهور است که خسرو پرویز داشت و مانند موم نرم میشد و هر صورتی که از آن میخواست میساخت *

گویند اهل عمل[8] آنرا باین مرتبه رسانیده بودند ـ و بجای آن سیم دست افشار نیز آمده ـ ظهوری گوید :

ترنج سیم دست افشار خسرو   انار سینهٔ شیرین نشان کرد

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(۱) صفحهٔ ۱۱   (۲) ترجمهٔ پارسی صفحهٔ ۳۲۸
(۳) نقل از غُرَر اخبار ملوک الفرس ثعالبی   (۴) از نسخهٔ خطی
(۵) در نسخهٔ خطی دیگر «برای زرّ مشت افشار شد»
(۶) چنانکه نیریزی گفته است   (۷) یعنی مشتفشار   (۸) کیمیاگران

عالب که سیم درینجا بمعنی طلا باشد(۱) پس اسعحاب دربن شعر جامی:

ردست افسار زرّین سر حمس شو   تا این سیم دست افشار نشو

باعتبار معنی حقیقی سیم باشد که فضّه است،،(۱) - کلمهٔ مشت پارسی در اوستا موسی mushti آمده(۲) *

۸ — نسک شماره - در صفحهٔ ۱۵۶ جماهر آمده: "و کان للاکاسره ایضاً نسخة من امثال ذلک(۲) الدّر الساهوار عددها فی السمط احدی و عشرون حبّة نسمی علی ما ذکر حمزه نسک سماره(۳) لانها علی [عدد](۵) نسک(۶) کتابهم المسمی ابستا(۷) و هی قطاعة المسوفه(۸) بالتوالی و کان یعلقها(۹) بالاصابع برسومها من السابع ورد؟ لهم عدوه کل یوم،، *

محشی کتاب دربارهٔ "لشک سماره(۱۰)،، نوسته: "لقطان فارسیان، معاهما. عدد بد قطع،،(۱۱) - اما نسک در اوستا نسکه naska بمعنی کتاب و سفینه آمده و هر جا که این لغت بکار رفته از آن کتاب مقدس اراده شده است(۱۲) - اما در سنا، هدی ۹، ۱، بند ۲۲ نسکه بمعنی خود اوستا و دورهٔ کامل آن آمده است(۱۲) - دینکرت، در فصلهای هشتم و نهم نویسد که اوستا دارای ۲۱ نسک میباشد و نام هر یک ازین بیست و یک بخش را جداگانه یاد میکند و خلاصهٔ مندرجات آنها را شرح میدهد - در فرهنگهای پارسی آمده(۱۴) . نسک بضم اول قسمی باشد از بست و یک قسم

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(۱) نام کتاب موید سررشته کوان بن کامکار، از پیروان آذر کیوان، درر مشت افشار، یا درر دست افشار، است

(۲) Air. Wb. mushti masah

(۳) رجوع شود جماهر صفحهٔ ۱۵۰ - ۱۵۶

(۴) در متن جامع لشک شماره، در حاشیه لسّک سماره - لسّک شماره

(۵) در اصل این کلمه نیست و تصحیح قیاسی است

(۶) در متن لشک - در حاشیه لسّک

(۷) نسخه بدل ابستا ابشا و هر دو خطاست

(۸) نسخه بدل المسّوفة

(۹) نسخه بدل یعلّقها

(۱۰) بالام و سین!

(۱۱) جماهر صفحهٔ ۱۵۶ ح ۲

(۱۲) خرده اوستا، پورداود صفحه ۳۶

(۱۳) یسنا، پورداود، ح ۱ صفحهٔ ۱۶۶

(۱۴) برهان - انجمن آرا

کتاب زند(۱) که زردشت آنرا منقسم کرده است و هر نسکی را یعنی هر قسمی را نامی نهاده،(۱) اما شمار و شماره و آمار و آماره همه از مصدر اوستائی مَرْ mar بمعنی شمردن و آمارش پهلوی نیز بمعنی شمردن و پتمار (پت + مار) و پسمار (پس + مار) بمعنی مدعی و مدعی علیه در پهلوی، همه ازین ریشه اند *

ازین مطالب آشکار شد که نسک شماره، در عهد ساسانیان نسخه‌ای بوده است که تمامت بیست و یک نسک اوستای ساسانیان شامل بیست و یک دانه درّ شاهوار بوده و شاهنشاهان آنرا در دست مطابق رسوم میگردانیدند *

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(۱) باید دانست که در فرهنگها نسک (بفتح اول و سکون ثانی) را بمعنی عدس (غلّهٔ مشهور) و نیز بمعنی خار و خسک گرفته اند، رجوع شود مزدیسنا و تأثیر آن در ادبیات پارسی، تألیف نگارنده صفحه ۲۲۵،

البیرونی

از

مولانا عبد السلام ندوی، دار المصنفین، اعظم گڈھ

قدیم تذکروں اور تاریخوں میں بیرونی کے حالات معجم الادباء جلد ششم، اخبار الحکماء شہر زوری، طبقات الاطباء ابن ابی اصیبعہ، تتمہ صوان الحکمۃ اور مختصر الدول میں مذکور ہیں،[1] لیکن یہ حالات اس قدر غیر مرتب، مجمل اور مبہم ہیں کہ ان سے بیرونی کی زندگی کا کوئی پہلو روشن طور پر نظر نہیں آتا، البتہ پروفیسر سخاؤ نے آثار الباقیہ کے مقدمہ میں اس کے حالات کے تمام ماخذوں کے ذریعہ سے اوس کے جو حالات لکھے ہیں، اون سے اوس کی زندگی کا اجمالی خاکہ پیش نظر ہوجاتا ہے، ان حالات کا خلاصہ مرزا محمد بن عبد الوہاب قزوینی نے حواشی چہار مقالہ میں درج کیا ہے، جس کو ہم سب سے پہلے درج کرتے ہیں، وہ لکھتے ہیں، کہ:

ابو ریحان بیرونی کے حالات جو اب تک لکھے گئے ہیں، اون میں بہترین حالات وہ ہیں، جن کو مستشرق اڈورڈ سخاؤ نے آثار الباقیہ کے مقدمہ میں لکھا ہے، اوس نے اون تمام ماخذ و مصادر کا جن سے ابو ریحان کی معمولی حالت بھی معلوم ہوتی ہے، مطالعہ کیا ہے، چونکہ مشرق میں ایران کے سب سے بڑے فلسفی اور ریاضی‌داں کے حالات صحیح طور پر معلوم نہیں ہیں، اس لئے پروفیسر سخاؤ کی تحریر کا خلاصہ اس موقع پر درج کرنا مناسب معلوم ہوتا ہے *

وہ ۳ ذیحجہ سنہ ۳۶۲ھ میں خوارزم میں پیدا ہوا، اور ۲ رجب سنہ ۴۴۰ھ میں غزنہ میں ۷۷ سال کی عمر میں وفات پائی بیرونی بیرون خوارزم کی طرف منسوب ہے،

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(۱) ریویو مع مولوی عنایت اللہ صاحب بی۔ اے علیگ نے بیرونی کے حالات میں ایک رسالہ لکھا ہے، اور ماسٹر عبد اللہ خان نے اپنی کتاب مشاہیر عالم حصہ اول میں چند صفحے بیرونی کے حالات میں لکھے ہیں، ان سب کے بعد مسٹر حسین زبیری نے ایک مستقل رسالہ بیرونی کے حالات میں لکھا ہے۔

کیونکہ وہ حوالیِ شہر خوارزم یا صوبہ خوارزم کا رہنے والا تھا، بہر حال خود شہر خوارزم کا باشندہ نہ تھا، اس لئے اوس کو بیرونی کہا گیا، سمعانی کتاب الانساب میں جو ابو ریحان بیرونی کی وفات کے تقریباً ایک سو سال بعد میں لکھی گئی کہتا ہے :

> بیرونی کی یہ نسبت، بیرون خوارزم کی طرف ہے، کیونکہ جو لوگ خود خوارزم کے باشندے نہیں ہوتے بلکہ اس شہر کے باہر کے باشندے ہوتے ہیں، اون کو بیرونی کہا جاتا ہے اور خوارزمیوں کی زبان میں ان لوگوں کو ایرک کہتے ہیں ابو ریحان منجم بیرونی اسی نسبت سے مشہور ہے *

بظاہر ابو ریحان نے اپنی عمر کے ابتدائی حصہ کو خوارزم میں مامونیوں کے ظل عاطفت میں جو خوارزم شاہیہ کے نام سے مشہور ہیں، بسر کیا، مامونیوں کا خاندان ابتداء میں شاہان سامانیہ کا باج گذار تھا، پھر سامانیوں کی سلطنت کے خاتمہ اور غزنویوں کے استقلال حکومت کے مابین یعنی سنہ ۳۸۴ھ سے سنہ ۳۹۰ھ کے درمیانی زمانہ میں یہ خاندان مستقلاً فرماں روا ہو گیا، لیکن اس استقلال کے چند ہی سال بعد سنہ ۴۰۷ھ میں سلطان محمود غزنوی نے خوارزم کو فتح کرکے اپنی وسیع سلطنت میں شامل کرلیا *

ابو ریحان نے چند سال جرجان میں شمس المعالی قابوس بن وشمگیر کے دربار میں بھی جس نے دو مختلف زمانوں یعنی سنہ ۳۶۶ھ تا سنہ ۳۷۱ھ اور سنہ ۳۸۸ھ تا سنہ ۴۰۳ھ میں جرجان اور مضافات جرجان میں حکومت کی، بسر کئے، اور حدود سنہ ۳۹۰ھ میں اس کے نام پر کتاب آثار باقیہ تصنیف کی، پھر سنہ ۴۰۰ھ سے سنہ ۴۰۷ھ تک کے درمیانی زمانہ میں ابو ریحان دوبارہ اپنے اصلی وطن خوارزم میں واپس آیا، اور ابو العباس مامون بن مامون خوارزم شاہ کے دربار میں رہا، اور خوارزمیوں کی شورش، خوارزم شاہ کا قتل، اور خوارزم شاہ کے خون کے بہانے سے سلطان محمود کی لشکرکشی اور فتح خوارزم کے تمام واقعات ابو ریحان نے خود اپنی آنکھوں سے دیکھے ہیں، اور ان تمام واقعات میں خود موجود رہا ہے،

ابو ریحان کی کتابوں کی فہرست میں ایک کتاب کا نام ''تاریخ خوارزم،، ھے، اور ابو ریحان نے اس کتاب میں حسب عادت اپنے وطن کے تمام اخبار، آثار اور قصص و حکایات بالخصوص اپنے زمانے کے تمام تاریخی واقعات جن کے اکثر حصے کو اوس نے بچشم خود دیکھا تھا، درج کئے ھیں، یہ کتاب بظاھر ناپید ھے، لیکن اس کی چند فصلوں کو ابو الفضل بیھقی نے تاریخ مسعودی کے آخر میں شامل کرلیا ھے *

بہر حال سلطان محمود جب خوارزم سے غزنہ کو واپس ھوا تو بہار سنہ ۴۰۸ ھ میں ابو ریحان اور ابو ریحان کے ساتھ دربار خوارزم شاھی کے تمام فضلاء کو اپنے ساتھ غزنہ لے گیا، غزنہ میں قیام کرنے کے بعد ابو ریحان نے کئی بار اپنے وطن خوارزم کا سفر کیا، اور محمود غزنوی نے ھندوستان پر جو حملے کئے اون میں اکثر محمود کے ساتھ رھا اور ھندوستان کے علماء و حکماء سے میل جول پیدا کرکے زبان سنسکرت سیکھی، اور تاریخ، ھیئت، ریاضی، جغرافیہ، اور علوم طبعیہ میں اون کے میل جول سے اپنی معلومات کو وسیع کیا، انھی سفروں میں ابو ریحان نے اپنی مشہور کتاب، کتاب الہند کا مواد، ھندوؤں کے علوم، مذاھب اور اخلاق و عادات کے متعلق جمع کیا، یہ کتاب سنہ ۱۸۸۷ ع میں زیر اھتمام پروفیسر سخاؤ حکومت ھندوستان کے صرفہ سے لندن میں چھپ گئی ھے *

ابو ریحان کی کتابیں دو زبانوں یعنی عربی اور فارسی میں ھیں، لیکن اوس کی کتابوں کے مطالعہ سے معلوم ھوتا ھے، کہ وہ سنسکرت زبان اور کسی قدر عبرانی اور سریانی زبان سے بھی واقف رکھتا تھا۔ البتہ یونانی زبان سے بالکل واقف نہ تھا، اور اوس نے بطلیموس اور جالینوس وغیرہ سے جو کچھ اپنی کتابوں میں نقل کیا ھے وہ اون یونانی ترجموں سے ماخوذ ھے، جو عربی یا سریانی زبان میں کئے گئے تھے *

ابو ریحان نے اپنی معلومات اون عمدہ کتابوں کے علاوہ جو اب ناپید ھیں، زیادہ‌تر لوگوں کی زبانی باتوں سے حاصل کی ھیں، اور ھمیشہ دوسرے مذاھب کے پیشواؤں اور دوسری قوموں کے علماء و حکماء سے میل جول پیدا کرکے کوشش بلیغ کے

ساتھ اون سے معلومات حاصل کرتا رہا ہے، بالخصوص ایران کے زردشتیوں اور اہل خوارزم، اہل صغد، اور اہل سمرقند کی تاریخ اور تقویم کے متعلق اوس نے جو نادر معلومات فراہم کی ہیں اون کا زیادہ‌تر حصہ زبانی روایتوں سے تعلق رکھتا ہے، کتابوں سے منقول نہیں ہے، اور اگر ابو ریحان قدماء کے آثار کے قائم رکھنے کا اس قدر حریص نہ ہوتا، تو اون کا نام و نشان بھی باقی نہ رہتا *

ابو ریحان کے زمانہ میں، اوس کے ہم‌وطن زیادہ‌تر اہورا مزدا کی پرستش کرتے تھے، اور اکثر شہروں اور قصبوں میں آتشکدے قائم تھے، اور زردشتی مذہب کے علماء کا اثر کلیۃً زائل نہیں ہوا تھا، یہی وجہ ہے کہ ابو ریحان کو ایسی معلومات بالخصوص زردشتیوں کے اخبار و آثار و تقالید و تعلیم کے متعلق اطلاعات حاصل کرنے کے عمدہ ذرائع میسر ہوئے *

ابو ریحان کی تصنیفات کے سرسری مطالعہ سے بھی اوس کے عقیدہ اور مشرب کا پتہ چلایا جاسکتا ہے، ابو ریحان صرف حقیقت پرست تھا، اور کسی چیز کو دنیا میں اوس پر ترجیح نہیں دیتا تھا، اور اوس نے حقیقت کو کسی دوسری غرض سے نہیں چھپایا، اور توہمات اور خرافات کے ابطال میں مطلق دریغ نہیں کیا، وہ مسلمان تھا، اور شیعیت کی طرف مائل تھا. لیکن متعصب، متشدد اور خشک مسلمان نہ تھا. اہل عرب سے جنھوں نے ساسانیوں کے مجد و شرف کا خاتمہ کیا سخت نفرت رکھتا تھا، اور ایرانی قوم کے ساتھ جو چیزیں تعلق رکھتی تھیں اون کا بے‌اختیارانہ شیدائی تھا، اوس زمانہ میں اسلام اس قدر طاقتور نہیں ہوا تھا، کہ کوئی شخص علانیہ دوسرے مذاہب کو حاصل نہ کرسکے، یا اون میں سے کسی ایک کی برائی یا بھلائی نہ بیان کرسکے، دقیقی جو سامانی خاندان کا شاعر تھا، اور ابو ریحان کے زمانہ سے بہت زیادہ پہلے نہ تھا، کمال آزادی کے ساتھ اس قسم کے شعر کہتا ہے:

دقیقی چار خصلت برگزیده است　　بگیتی از همه خوبی و زشتی

لب یاقوت رنگ و نالهٔ چنگ　　مئے گلرنگ و کیش زردهشتی

لیکن اس کے چند دنوں بعد یعنی سلطان محمود غزنوی کے زمانہ میں اس قسم کے اشعار بےشبہہ شاعر کی زندگی کو خطرے میں ڈال سکتے تھے[1] *

پروفیسر سخاؤ نے بیرونی کے جو حالات لکھے ہیں، اگرچہ وہ بہت زیادہ مفصل و مرتب ہیں، اور ہمارے موجودہ تذکروں میں اگرچہ یہ ترتیب نہیں پائی جاتی تاہم اون میں اور بہت سی باتیں بھی مذکور ہیں، جن کو پروفیسر سخاؤ نے چھوڑدیا ہے، اس لئے ہم اس موقع پر اون کو بھی درج کرتے ہیں، تاکہ بیرونی کی زندگی کا کوئی حصہ چھوٹنے نہ پائے *

وطن :— بیرونی کے وطن میں اختلاف ہے، طبقات الاطباء میں لکھا ہے، کہ بیرون سندھ کا ایک شہر ہے، اور بیرونی اسی شہر کی طرف منسوب ہے[2] *

اخبار الحکماء شہر زوری میں بھی یہی لکھا ہے، اور اس پر اس قدر اضافہ کیا ہے کہ "بیرون جو اوس کا جنم بھوم اور وطن ہے، ایک عمدہ شہر ہے، اور اس میں عجائب و غرائب پائے جاتے ہیں، اور یہ کوئی عجیب بات نہیں، کیونکہ موتی سیپ ہی میں رہتا ہے،، لیکن در حقیقت یہ بالکل غلط ہے، اور غلطی کا سبب یہ ہے، کہ سندھ میں بیرون ایک شہر ہے، اور ابن حوقل جغرافی کی کتاب المسالک کے ایک قدیم نسخہ میں سندھ کا ایک نقشہ موجود ہے جس میں بیرون کا موقع و محل بتادیا گیا ہے، خود بیرون سندھ میں کوئی شہر نہیں. غالباً لوگوں نے غلطی سے اسی بیرون کو بیرون پڑھا اور ابو ریحان کو اس کی طرف منسوب کردیا، بیرونی کی سنسکرت‌دانی اور کتاب الہند بھی اس غلطی کا سبب ہوسکتی ہے، کیونکہ ہندوستان کی ایک قدیم زبان اور ہندی مذہب، ہندی تمدن، اور ہندی علوم سے اس قدر دلچسپی صرف اوسی شخص کو ہوسکتی ہے، جو خود ہندوستانی ہو، بہر حال نہ بیرون سندھ کا کوئی شہر ہے. نہ بیرونی وہاں پیدا ہوا اس کا اصلی مولد خوارزم کا کوئی گانؤں ہے، اس کے متعلق کتاب الانساب سمعانی کا حوالہ خود پروفیسر سخاؤ نے دیا ہے، اور

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(۱) حواشی چہار مقالہ از صفحہ ۱۹۳ تا صفحہ ۱۹۷ (۲) طبقات الاطباء جلد ۲ صفحہ ۲

اقوت کی معجم الادباء سے بھی اس کی تائید ہوتی ہے، چنانچہ اوس نے بیرونی کا تذکرہ ان الفاظ سے شروع کیا ہے:

محمد بن احمد ابو الریحان البیرونی الخوارزمی اور اس نسبت کے معنی باہر والے کے ہیں، کیونکہ فارسی میں بیرون کے معنی باہر کے ہیں میں نے بعض فضلاء سے اس کے متعلق دریافت کیا تو اوس نے بیان کیا کہ اوس نے خوارزم میں بہت کم قیام کیا، اور اہل خوارزم اجنبی کو بیرونی کہتے ہیں، گویا جب وہ اون سے بہت دنوں تک الگ رہا، تو وہ اجنبی ہوگیا لیکن میرے خیال میں اس کی وجہ یہ ہے، کہ وہ دیہات کا باشندہ تھا، یعنی وہ شہر کے باہر کا رہنےوالا تھا[1] *

ولادت اور وفات — ہمارے تذکرہ‌نویسوں نے بیرونی کا سال ولادت نہیں لکھا، البتہ یاقوت نے اوس کے سال وفات کے متعلق لکھا ہے، کہ میرے خیال میں اوس نے غزنہ میں سنہ ۴۰۳ھ کے حدود میں بڑی عمر میں وفات[2] پائی. لیکن یہ بالکل غلط ہے، اور یہ غلطی خود یاقوت کی معجم الادباء ہی سے ظاہر ہوجاتی ہے، کیونکہ وہ لکھتا ہے کہ "سلطان محمود نے سنہ ۴۲۱ھ میں انتقال کیا، اور ابو ریحان غزنہ میں زندہ تھا،"[3] اس سے صاف ثابت ہوتا ہے کہ ابو ریحان نے سنہ ۴۲۱ھ تک وفات نہیں پائی تھی، غالباً یہ کاتب کی غلطی ہے، جس نے سنہ ۴۳۰ھ کے بجائے سنہ ۴۰۳ھ لکھدیا ہے، بیرونی کے سال ولادت کے متعلق تو ہمارے تذکرہ‌نویسوں نے غلط یا صحیح طور پر کچھہ نہیں لکھا، البتہ خود بیرونی سے اس کے ایک دوست نے اس کی تصنیفات کی فہرست طلب کی ہے اور اس کے جواب میں بیرونی نے لکھا ہے کہ:

تم مجھہ سے اون کتابوں کے نام دریافت کرتے ہو جو سنہ ۴۲۷ھ تک لکھی جاچکی ہیں، اس وقت میری عمر قمری مہینہ سے ۶۵ سال اور شمسی مہینے سے ۶۳ سال کی ہے *

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(۱) معجم الادباء جلد ٦ صفحہ ۳۰۸

(۲) معجم الادباء جلد ٦ صفحہ ۳۱۲ (۳) ایضاً جلد ٦ صفحہ ۳۰۸

اس سے ایک طرف تو یاقوت کے لکھے ہوئے سن وفات کی غلطی ثابت ہوتی
دوسری طرف یہ معلوم ہوجاتا ہے، کہ وہ سنہ ۳۶۲ھ میں پیدا ہوا، البتہ اس
اوس کی ولادت کے مہینے اور دن کی تعیین نہیں ہوتی، لیکن ابو اسحاق ابراھیم
محمد الغضنفر التبریزی نے بیرونی کے اُس خط کی شرح میں ایک رسالہ لکھا
جس کی نقل یورپ میں موجود ہے، اور اوس میں اوس نے یہ تصریح لکھا
کہ وہ ۳ ذیحجہ کو پنجشنبہ کے دن بوقت صبح خوارزم میں پیدا ہوا، اور ابو ریحان
ایک شاگرد امام فاضل سرخسی کے خط میں ابو ریحان کی کتابوں میں سے
کتاب کے حاشیے پر یہ تحریر تھا، کہ ابو ریحان نے ۲ رجب سنہ ۴۴۰ھ کو جمعہ
عشاء کے بعد انتقال کیا، اور دوسرے موقع پر کسی دوسرے کے ھاتھہ سے لکھا
ہوا ہے، کہ ابو ریحان کی عمر اس وقت ۷۷ سال ۷ ماہ کی تھی[1] *

خاندان اور تعلیم، و تربیت :— ہمارے تذکروں سے ابو ریحان کے خاندان
طفولیت اور تعلیم و تربیت کا حال بالکل معلوم نہیں ہوتا، البتہ خود ابو ریحان نے
آثار الباقیہ میں اپنے دو استادوں کا نام لیا ہے، ایک ابو نصر منصور بن علی بن
عراق مولی امیر المومنین[2] کا اور ان کی نسبت تصریح کے ساتھہ "استادی،، کا لفظ
لکھا ہے، دوسرا نام سداد سرخسی کا ہے، جس کو مسٹر سخو جس نے اس کے
اساتذہ میں شمار کیا ہے، لیکن ابو ریحان نے آثار الباقیہ میں ان کا نام اس طرح لیا ہے،
"محمد بن اسحاق بن استاد سداد سرخسی،،[3] جس سے یہ وضاحت یہ ثابت نہیں ہوتا،
کہ سداد سرخسی خود اس کے استاد تھے ممکن ہے کہ اوستاد اون کا لقب ہو،
یاقوت کی معجم الادباء سے ابو ریحان کے ایک اور استاد کے نام کا پتہ چلتا ہے،
وہ لکھتا ہے کہ "محمود نے جب خوارزم پر قبضہ کیا تو ابو ریحان اور اس کے
اوستاد عبد الصمد اول بن عبد الصمد کو گرفتار کیا، اور اس پر باطنیت اور کفر کا
الزام لگا کر قتل کردیا،[4] بہر حال موجودہ تذکروں سے اس سے زیادہ اوس کی
تعلیم و تربیت پر کوئی روشنی نہیں پڑتی *

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(۱) پروفیسر سخاؤ نے آثار الباقیہ کے مقدمہ میں ان کے اصل الفاظ نقل کئے ہیں

(۲) آثار الباقیہ صفحہ ۱۸۴ (۳) ایضاً صفحہ ۲۵ (۴) معجم الادبا جلد ۶ صفحہ ۳۱۱

درباری تعلقات :— ابو ریحان نے طویل عمر پائی اور اس وسیع مدت میں اوس کے تعلقات مختلف شاہی درباروں سے قائم ہوئے، معجم الادباء کی عبارت سے معلوم ہوتا ہے کہ ابو ریحان کو سب سے پہلے شمس المعالی قابوس بن وشمگیر نے اپنے دربار میں طلب کیا، لیکن ابو ریحان نے اس سے انکار کیا، چنانچہ وہ لکھتا ہے، کہ ''قابوس نے اوس کو اپنی صحبت کے لئے مخصوص کرنا اور اپنے گھر میں رکھنا چاہا اور اس شرط کے ساتھ چاہا، کہ اوس کی سلطنت کے تمام مقبوضات و مملوکات پر اس کا حکم نافذ ہوگا، لیکن ابو ریحان نے انکار کیا،[1] لیکن قابوس بن وشمگیر سنہ ۳۶۳ھ میں تخت نشین ہوا ہے، اور سنہ ۳۷۱ھ میں دیلمیوں نے اوس کی حکومت پر قبضہ کرلیا ہے، ابو ریحان سنہ ۳۶۲ میں پیدا ہوا ہے، اس لئے سنہ ۳۷۱ میں اس کی عمر صرف نو سال کی تھی، اور اس عمر میں وہ اوس کے دربار میں طلب کئے جانے کے قابل نہ تھا، البتہ قابوس نے سنہ ۳۸۸ھ میں دوبارہ حکومت حاصل کی، اور سنہ ۴۰۴ھ کے ہنگامے میں قتل ہوا، اس لئے اس کا تعلق قابوس کے دربار سے اسی زمانے میں ہوا، اور اسی زمانہ میں اوس نے قابوس کے نام پر آثار الباقیہ لکھی، معجم الادباء کی عبارت سے معلوم ہوتا ہے، کہ بیرونی نے اس سے انکار کیا، اور بیرونی کے سوانح زندگی میں اس قسم کے استغناء کی بعض مثالیں بھی موجود ہیں، لیکن غالباً افلاس و تنگدستی نے اوس کو اس تعلق پر مجبور کیا، کیونکہ وہ خود آثار الباقیہ میں لکھتا ہے کہ ''یہ فصل مجھکو ایک ایسی حالت یاد دلاتی ہے، جس پر احمد بن فارس کا یہ قول صادق آتا ہے :

قد قال فيما مضى حكيم ما المرء الا باصغريه

گذشتہ زمانہ کے ایک حکیم کا قول ہے، کہ آدمی اپنے دو چھوٹے عضو یعنی دل اور زبان سے آدمی ہوتا ہے :

فقلت قول امرء لبيب ما المرء الا بدرهميه

(۱) معجم الادباء جلد ٦ صفحہ ٣٠٩ و شہر زوری صفحہ ٩٥

لیکن میں نے ایک عقلمند آدمی کا یہ قول بیان کیا، کہ آدمی اپنے دو درھموں سے آدمی ھوتا ھے:

س لم یکن معه درهماه لم یلتفت عرسه الیه

حس کے پاس اوس کے دو درھم نہ ھوں اوس کی بی بی بھی اس کی طرف متوجہ نہیں ھوتی *

وہ یہ کہ حس زمانہ میں، میں بندگان عالی کے دربار سے الگ تھا، میں نے رے میں نجوم کے ایک عالم کو دیکھا، کہ اوس نے نجوم کے احکام کے استخراج کا ایک طریقہ استعمال کیا لیکن میں نے اوس کو بتایا، کہ صحیح طریقہ اس کے خلاف ھے، لکن اوس نے مغرورانہ طور پر مجھکو حقیر سمجھا حالانکہ علمی حیثیت سے اوس کا درجہ مجھہ سے بہت کم تھا، اوس نے میرے قول کو جھٹلایا، اور مجھہ پر زبان درازی کی، کیونکہ مجھہ میں اور اس میں دولت اور افلاس کا فرق تھا اور افلاس ایک ایسی چیز ھے، کہ اوس کی وجہ سے ساقب و مفاخر، معائب و مثالب بن جاتے ھیں، اور میں اوس وقت ھر حیثیت سے مبتلائے مصیبت اور پریشان حال تھا، پھر جب مصیبتیں کسی قدر کم ھوئیں تو اوس نے مجھہ سے دوستانہ تعلقات قائم کرلئے[1] *

اس تصریح سے معلوم ھوتا ھے، کہ وہ قابوس کے دربار کے تعلق سے پہلے نہایت تنگدست اور شکستہ حال تھا، اور اسی تنگدستی اور شکستہ حالی نے اوس کو قابوس کے دربار کے تعلق پر مجبور کیا ھوگا *

اس کے بعد اوس کا تعلق خوارزم شاھی دربار سے ھوا، خوارزم شاھیوں کا خاندان جیسا کہ اوپر گذرا سنہ ۳۸۴ھ سے سنہ ۴۰۹ھ کے درمیانی زمانے میں مستقلاً فرماں‌روا ھوا، اور سنہ ۴۰۷ھ میں سلطان محمود غزنوی نے اون کی حکومت کا خاتمہ کردیا. اس لئے اس دربار سے ابو ریحان کا تعلق سنہ ۴۰۹ھ کے بعد ھوا ھوگا، بہر حال ابو ریحان نے اس دربار میں بھی نہایت عزت و احترام حاصل کیا، چنانچہ ایک دن

(۱) آثار الباقیہ صفحہ ۳۳۸

حوارزم شاہ سواری پر ابو ریحان کے مکان سے گذرا، اور حکم دیا کہ ابو ریحان کو حجرے سے بلا لیا جائے، ابو ریحان نے کچھہ دیر کی تو خوارزم شاہ نے سواری کی باگ موڑی اور خود اترنا چاھا، لیکن ابو ریحان اوس سے پہلے حجرہ سے نکل آیا، اور قسم دلا کر کہا کہ آپ سواری سے نہ اوتریں اس پر خوارزم شاہ نے یہ شعر پڑھا :

العلم من اشرف الولایات یاتیہ کل الوری ولایاتی

علم سب سے زیادہ معزز ملک ھے، کہ تمام لوگ اوس کے پاس آتے ھیں، اور وہ خود نہیں آتا *

پھر کہا ''اگر دنیا کا دستور نہ ہوتا تو میں آپ کو نہ بلواتا، کیونکہ علم بلند ہوتا ھے، اور اس کے اوپر بلندی نہیں حاصل کی جاتی،، غالباً اوس نے معتضد کے حال میں اس فقرہ کو سنا ہوگا، کیونکہ معتضد ایک دن ثابت بن قرہ الحرانی کا ھاتھہ پکڑے ہوئے باغ میں گھوم رہا تھا، کہ دفعةً اپنے ھاتھہ کو کھینچ لیا، اس پر ثابت نے کہا کہ ''امیر المومنین کیا واقعہ پیش آیا،،؟ اوس نے کہا کہ ''میرا ھاتھہ آپ کے ھاتھہ کے اوپر تھا، حالانکہ علم بلند ہوتا ھے، اور اس کے اوپر بلندی نہیں حاصل کی جاتی،، [1] *

خوارزم شاھوں کی شاھی کے بعد اوس کا تعلق سلطان محمود غزنوی کے دربار سے ہوا، لیکن یہ مسئلہ تحقیق طلب ھے، کہ اس دربار سے اوس کا تعلق کیونکر پیدا ہوا؟ اس کے متعلق نظامی عروضی سمرقندی نے چار مقالہ میں یہ روایت نقل کی ھے کہ :

سلطان محمود غزنوی نے ابو العباس مامون خوارزم شاہ کو ایک خط لکھا کہ تمہارے دربار میں حد بےنظیر فضلاء کا مجمع ھے، اون کو ھمارے دربار میں بھیجدو تاکہ ھم اون کے علم و فضل سے بہرہ اندوز ہوکر تمہارے ممنون احسان ہوں، خوارزم شاہ نے اپنے دربار کے حکماء کو جمع کرکے یہ خط سنایا تو شیخ ابو علی سینا اور ابو سہل یحیی نے تو جانے سے انکار کردیا، لیکن ابو نصر، ابو الخیر اور ابو ریحان مال ترغیبات کی بنا پر راضی ہوگئے، [2] اس کے بعد شیخ بو علی سینا اور

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(۱) معجم الادباء جلد ۶ صفحہ ۳۰۹ - ۳۱۰

(۲) چہار مقالہ صفحہ ۷۷

ابو سہل یحییٰ کے فرار و گرفتاری کا طویل قصہ مذکور ہے، لیکن یہ روایت مشتبہ ہے، اور اس روایت کی غلطی اس سے بھی ثابت ہوتی ہے، کہ یاقوت نے معجم الادباء میں ابو ریحان کا مفصل تذکرہ لکھا ہے۔ لیکن کہیں بھی اس واقعہ کا تذکرہ نہیں کیا ہے، بلکہ اس کے بجائے یہ لکھا ہے کہ غزنہ میں ابو ریحان کے جانے کا سبب یہ ہوا، کہ سلطان محمود نے جب خوارزم کو فتح کیا تو ابو ریحان اور اُس کے اوستاد عبد الصمد اول بن عبد الصمد حکیم کو گرفتار کیا، اور اس پر باطنیت اور کفر کا الزام لگایا، اس بنا پر عبد الصمد کو تو قتل کردیا اور ابو ریحان کو بھی قتل کرنا چاہا، لیکن ایک وجہ سے وہ بچ گیا، محمود سے کہا گیا کہ وہ علم نجوم میں اپنے وقت کا امام ہے، اور بادشاہ لوگ اوس جیسے شخص سے بےنیاز نہیں رہ سکتے، اب سلطان محمود نے اوس کو اپنے ساتھ لے لیا، اور وہ بلاد ہند میں آیا، اور اہل ہند میں رہا، اون کی زبان سیکھی اور اون کے علوم اخذ کئے، اس کے بعد غزنہ میں قیام کیا، اور وہیں وفات پائی، [1] بہر حال ابو ریحان کو سلطان محمود نے اپنی صحبت کے لئے مخصوص کرلیا، اور نجوم اور آسمان کے متعلق اوس کے ذہن میں جو باتیں آتی تھیں، اون پر ابو ریحان سے گفتگو کیا کرتا تھا، چنانچہ ایک بار اوس کے پاس اقصائے بلاد ترک سے ایک قاصد آیا، اور اپنا مشاہدہ یہ بیان کیا کہ قطب جنوبی میں سمندر کے پار آفتاب کی ایک ایسی گردش ہوتی ہے، کہ رات بالکل نہیں ہوتی، چونکہ سلطان محمود کو مذہب میں سخت تشدد تھا، اس لئے اوس نے اس پر الحاد و باطنیت کا الزام لگایا، لیکن ابو نصر بن مشکان نے کہا کہ وہ یہ اپنی رائے سے نہیں بیان کرتا، بلکہ اپنا مشاہدہ بیان کرتا ہے، اس پر اوس نے یہ آیت پڑھی:

"وجدها تطلع علی قوم لم نجعل لهم من دونها ستراً"، اوس نے سورج کو ایک ایسی قوم پر طلوع ہوتے ہوئے پایا کہ ہم نے اوس کے سامنے اس کے لئے پردہ نہیں بنایا *

اب سلطان نے اس کے متعلق ابو ریحان سے دریافت کیا تو اوس نے اختصار کے ساتھ اس کو ثابت کیا، سلطان محمود بعض اوقات بات کو اچھی طرح سنتا تھا،

(۱) معجم الادبا جلد ۶ صفحہ ۳۱۱ و ۳۱۲

اور انصاف کرنا بھا، اس لئے اوس نے ابو ریحان کے بیان کو تسلیم کرلیا، اور دونوں کے درمیان گفتگو کا خاتمہ ہوگیا[1] *

مسٹر سید حسن برنی لکھتے ہیں کہ:

خوارزم کی فتح کے بعد جب محمود اپنے دارالسلطنت کی طرف لوٹا تو تمام مشاہیر ملک اور اراکین حکومت کو مقید کرلیا، ان پولٹکل قیدیوں میں ہمارا ممدوح بیرونی بھی تھا، غزنی آکر اوس کا کیا حشر ہوا؟ تمام موجودہ تاریخیں اس کا جواب دینے سے عاجز ہیں، اور تاوقتیکہ مستند تاریخی شہادتیں دستیاب نہ ہوجائیں، کوئی قول فیصل صادر نہیں ہوسکتا، موجودہ روایات کی کمزوری اور صحیح واقعات کی گم گشتگی کی وجہ سے ہم مجبور ہیں، کہ بیرونی کی تصنیف اور واقعات پر غور کرتے ہوئے، کوئی قیاسی نتیجہ اخذ کریں، ظہیر الدین البیہقی اور شمس الدین شہر زوری نے البیرونی کے تذکرے میں کہیں یہ اشارہ نہیں کیا، کہ بیرونی کا محمود کے دربار سے کوئی تعلق تھا *

لیکن خود شہر زوری نے معجم الادباء کی اس روایت کو لیا ہے، اور اس واقعہ کا ذکر کیا ہے، اس سے بڑھکر سلطان محمود کے تعلق اور ملازمت کی اور کیا شہادت ہوسکتی ہے؟ البتہ بیرونی نے خود سلطان محمود کے نام پر کوئی کتاب نہیں لکھی لیکن محمود کے بعد جب بیرونی کا تعلق اوس کے بیٹے سلطان مسعود کے دربار سے ہوا، تو اوس نے بیرونی کی قدردانی سلطان محمود سے بھی زیادہ کی اور بیرونی نے اوس کے نام پر متعدد کتابیں لکھیں، اور اس کی وجہ یہ بھی کہ سلطان مسعود خود نہایت علم پرور تھا، اور علم نجوم کی طرف خاص طور پر مائل تھا، چنانچہ ایک دن اوس نے بیرونی سے اس مسئلہ پر اور رات اور دن کی مقدار کے اختلاف پر گفتگو کی اور یہ چاہا کہ اوس کو ایک ایسی دلیل معلوم ہونی چاہئے، جس کی صحت مشاہدہ سے اتنک ثابت نہیں ہوئی ہے، اس پر ابو ریحان نے کہا کہ ''اس وقت آپ مشرق و مغرب کے

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(۱) معجم الادبا جلد ٦ صفحه ٣١٠

مالک اور زمین کے بادشاہ کے لقب کے حقیقی مستحق ھیں، اس لئے اس مسئلہ سے واقف ھونے کا سب سے زیادہ حق آپ کو حاصل ھے، چنانچہ بیرونی نے اس کے لئے اس موضوع پر ایک کتاب لکھی، جو منجمین کے موضوع اور اصطلاح سے الگ تھی، اور جو شخص اون کا عادی نہ ھو، وہ بھی اس کو سمجھہ سکتا تھا، سلطان مسعود چونکہ عربیت کا ماھر تھا، اس لئے اوس نے آسانی کے ساتھہ اس کو سمجھہ لیا، اور بیرونی کو صلہ و عطیہ دیا، اسی طرح اوس کے حکم سے ایک کتاب لوازم الحرکتین تصنیف کی جو قرآن مجید کی آیتوں کے اقتباسات سے لبریز تھی، سلطان مسعود کے نام پر اوس نے سب سے بڑی کتاب جو لکھی وہ قانون مسعودی تھی،[1] سلطان مسعود نے بھی اس کی یہ قدردانی کی، کہ اوس کے صلہ میں ایک بار فیل چاندی انعام میں دی، لیکن بیرونی نے اوس کو بیزاری کے ساتھہ واپس کردیا[2] *

سلطان مسعود کی شہادت کے بعد اوس کا بیٹا شہاب الدولہ ابو الفتح مودود فرمانروا ھوا، تو بیرونی کا تعلق اوس کے دربار سے بھی قائم ھوا، اور اس کے نام پر کتاب الدستور لکھی[3] *

اخلاق و عادات — بیرونی کے اخلاق و عادات کے متعلق ھمارے تذکرہ نویسوں نے کچھہ نہیں لکھا، صرف یاقوت نے معجم الادباء میں اس قدر لکھا ھے، کہ وہ پاکیزہ معاشرت رکھتا تھا، اوس کے الفاظ اگرچہ بیباکانہ تھے، لیکن اس کے افعال پاکبازانہ تھے،[4] شہر زوری نے اوس کے بعض اخلاقی مقولے بھی نقل کئے ھیں، اور اس کا حلیہ یہ لکھا ھے کہ وہ گندم گوں اور پست قامت تھا، اس کی داڑھی بڑی اور سفید تھی، اور اس کا پیٹ بڑا تھا *

بیرونی کی تصنیفات اور اس کا علمی پایہ :— بیرونی کی عام شہرت علم ھیئت اور علم نجوم وغیرہ میں ھے، اور اس میں شبہہ نہیں کہ اوس نے زیادہ تر کتابیں انہی علوم کے متعلق لکھی ھیں، لیکن اسی کے ساتھہ وہ اور علوم سے بھی نا آشنا نہ تھا،

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(۱) معجم الادبا جلد ٦ صفحہ ۳۱۰ - ۳۱۱

(۲) شہر زوری قلمی صفحہ ۹۳

(۳) ایضاً صفحہ ۹۸

(۴) معجم الادباء جلد ٦ صفحہ ۳۱۲

علامه اس ابی اصیبعه ے لکھا ھے که وه فن طب پر عمده نظر رکھتا تھا، ریاضی و نجوم کے علاوه دوسرے علوم حکمیه سے بھی واقف تھا، چنانچه ان علوم کے متعلق شیخ ابو علی سینا سے اوس کے مباحثات و مراسلات بھی ھوچکے ھیں. لیکن وه ریاضی اور نجوم کے علاوه دوسرے علوم حکمیه میں شیخ کا ھم‌پله نه تھا، چنانچه سہر زوری ے اوس کے حالات میں لکھا ھے که شیخ بو علی سینا کے ساتھه اوس کے مناظرات ھیں، لیکن معقولات کے سمندر میں گھسنا اوس کا کام نه تھا، اور ھر شخص وھی کام کرسکتا ھے، جس کے لئے وه پیدا کیا گیا ھے *

ان علوم کے ساتھه وه ادبی علوم کا ذوق بھی رکھتا تھا، اور یاقوت ے معجم الادباء میں اسی حیثیت سے اوس کا تذکره کیا ھے، اور لکھا ھے که وه ایک بڑا ادیب اور لغوی تھا، اور ان علوم میں اس کی متعدد تصنیفات ھیں، جن کو میں ے دیکھا ھے، ایک تو ابو تمام کے اشعار کی شرح ھے جس کا نسخه میں ے خود اوس کے ھاتھه کا لکھا ھوا دیکھا ھے لیکن اس کو اوس ے مکمل نہیں کیا، دوسری کتاب کا نام ''التعلل باحالة الوهم فی معانی نظم اولی الفضل،، ھے، ایک کتاب میں اوس ے سلطان محمود کے زمانه کی تاریخ اور اُس کے باپ کے حالات لکھے ھیں، خوارزم کے حالات میں ایک کتاب لکھی ھے، جس کا نام کتاب المسامره ھے، ایک کتاب کا نام مختار الاشعار و الآثار ھے *

ان تاریخی اور ادبی کتابوں کے علاوه اوس ے جو کتابیں نجوم، ھیئت، منطق، اور حکمت میں لکھی ھیں، ان کا شمار نہیں ھوسکتا، یاقوت ے لکھا ھے، که میں ے وقف جامع مرو میں اس کی کتابوں کی فہرست گنجان خط میں ساٹھه ورق میں دیکھی ھے،[1] اور تمام تذکرے بھی اس کی کثرت تصنیف، علمی انہماک اور علمی ذوق کے مداح ھیں، سہر زوری ے لکھا ھے که وه ھمیشه تصنیف و تالیف میں مصروف رھتا تھا، اور اس کا ھاتھه قلم کو، اوسکی آنکھه مطالعه کو، اور اس کا دل غور و فکر کو، صرف کھانے کے اوقات میں چھوڑتا تھا، اس کی تصنیفات ایک

(۱) معجم الادباء جلد ٦ صفحه ۳۱۱

اوسٹ کے بار سے زیادہ ھیں،[1] یاقوت نے لکھا ھے کہ وہ ان مشاغل کو صرف نوروز اور مہرگان کے دن چھوڑتا تھا، تاکہ معاش کا سامان کرلے، اس کے بعد بقیہ دنوں میں صرف علمی اشغال میں مشغول رھتا تھا، یہاں تک کہ فقیہ ابو الحسن علی بن عیسیٰ الولوالجی کا بیان ھے، کہ میں ابو ریحان کے پاس ایسی حالت میں گیا، جب کہ وہ دم توڑ رھا تھا، لیکن اس حالت میں بھی اوس نے کہا کہ تم نے جداب فاسدہ کے حساب کے متعلق مجھہ سے ایک دن کیا کہا تھا؟ مجھکو اوس پر رحم آیا اور میں نے کہا کہ اس حالت میں؟ ابو ریحان نے کہا کہ کیا اس مسئلہ کا علم اس سے بہتر نہیں ھے، کہ میں دنیا کو اس حالت میں چھوڑوں نہ اس سے جاھل رھوں، چنانچہ میں نے اس مسئلہ کو دوبارہ بیان کیا، اور اوس نے اوس کو یاد کرلیا، اس کے بعد میں اوس کے پاس سے نکلا تو راستہ ھی میں تھا، کہ رونے پیٹنے کی آواز سنی[2] *

ان تمام تصریحات سے اوس کے علمی ذوق، علمی انہماک اور کثرت تصنیفات کا حال معلوم ھوسکتا ھے، بیرونی نے خود اپنی اون تصنیفات کی ایک فہرست جو سنہ ۴۲۷ھ تک یعنی اس کی وفات سے ۱۳ سال پیشتر تک لکھی جاچکی تھیں اپنے ایک دوست کو بھیجی ھے، اور وہ آثار الباقیہ کے مقدمہ میں شامل ھے، ان کتابوں کی تعداد ۱۱۴ ھے، لیکن یہ فہرست بالکل نامکمل ھے، اولاً تو وہ اس کے بعد تیرہ سال تک زندہ رھا، اور اس مدت میں بھی اوس نے کچھہ کتابیں لکھی ھونگی، اس کے علاوہ اس وقت او کتابیں بھی زیر تصنیف تھیں، اور ان سب کے علاوہ اس کی بہت سی تصنیفات کے نام اس کی دوسری کتابوں میں ملتے ھیں، اور بہت سی تصنیفات کے نام حاجی خلیفہ نے کشف الظنون میں لکھے ھیں، اس کی کتابوں کے اور بھی بہت سے نسخے یورپ اور دنیا کے دوسرے کتب خانوں میں ملتے ھیں، اور ان سب کی فہرست مسٹر سید حسن برنی نے اپنے رسالہ میں دیدی ھے، لیکن بیرونی کی ان تصنیفات کا دفتر بےپایاں اب بالکل ناپید ھے، البتہ اوس کی دو کتابیں

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(۱) شہر زوری قلمی صفحہ ۹۳ (۲) معجم الادباء جلد ٦ صفحہ ۳۰۸-۳۰۹

یعنی آثار الباقیہ اور کتاب الہند شائع ہوچکی ہیں، اور ہم اون کے چند اقتباسات اس موقع پر درج کرتے ہیں:

بیرونی نے اگرچہ آثار الباقیہ ریاضی کے ایک خاص موضوع پر لکھی ہے، تاہم اوس نے اوس میں اور بہت سی دلچسپ علمی، تاریخی، مذہبی اور فلسفیانہ باتیں لکھی ہیں، اور ان پر آزادانہ تنقید کی ہے اور اس کی وجہ یہ بتائی ہے کہ

> بعض موقعوں پر اگرچہ ہم دوسرے فنوں پر بحث کرنے لگے ہیں، اور ایسی چیزوں میں گھس پڑتے ہیں، جن کا تعلق عبارت سے بہت دور کا ہوتا ہے، لیکن اس کا مقصد طوالت سندی نہیں ہوتا، بلکہ مقصود یہ ہوتا ہے کہ ناظرین کا ذہن کند نہ ہونے پائے، کیونکہ ایک ہی فن پر ہمیشہ نظر رکھنے سے ذہن کند ہوجاتا ہے، اور آدمی اس کو برداشت نہیں کرسکتا، لیکن جب ایک فن کو چھوڑ کر وہ دوسرا فن اختیار کرتا ہے، تو گویا وہ چند باغوں کی سیر کرتا ہے، کہ ایک باغ کے بعد دوسرا باغ آتا ہے، تو وہ نہایت رغبت کے ساتھہ اوس کو دیکھنے لگتا ہے، چنانچہ یہ مشہور مقولہ ہے کہ ہر نئی چیز میں لذت ہوتی ہے[1] *

اس حیثیت سے اوس کی یہ کتاب دور گذشتہ کے اہم تاریخی، مذہبی اور علمی مسائل کی ایک تنقیدی تاریخ ہے، اور اس سے معلوم ہوسکتا ہے، کہ اگر ہمارے فلاسفر تاریخی کتابیں لکھتے تو یہ فن موجودہ دور کی تنقیدی موشگافیوں سے بے نیاز ہوجاتا، لیکن ہمارے فلاسفروں میں صرف ابن مسکویہ نے مستقلاً اور بیرونی نے ضمناً اس قسم کے مسائل پر تنقید کی ہے. اور ہم ان میں سے چند مسائل کو بیان کرتے ہیں بیرونی نے ایران کے قدیم بادشاہوں کے نام، القاب اور حالات نہایت تفصیل کے ساتھہ لکھے ہیں، تاہم یہ تصریح کردی ہے، کہ ان میں بہت سی باتیں ناممکن، دور از کار اور ناقابل قبول ہیں، چنانچہ لکھتا ہے:

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(۱) آثار الباقیہ صفحہ ۲۷

ایرانیوں کے پہلے حصہ کی تاریخ، بادشاہوں کی عمروں، اور ان کے مشہور کارناموں کے متعلق اون کے یہاں ایسی روایتیں موجود ہیں، جن کے سننے سے دل بیزاری ظاہر کرتے ہیں، کان اون کو پھوک دیتے ہیں، اور عقلیں اون کو قبول نہیں کرتیں، لیکن ہم نے جو روش اختیار کی ہے، اوس کا مقصد صرف تاریخی واقعات کا بیان کرنا ہے، روایات کی تنقید کرنا نہیں ہے(۱) *

اس ضمن میں اوس نے تاریخی حیثیت سے بعض ادبی نکتے بھی بیان کئے ہیں مثلاً شعرائے ایران جو ہزار سالہ زندگی کی دعائیں دیتے ہیں، ہم اوس کو مبالغہ سمجھتے تھے، لیکن بیرونی کے بیان سے معلوم ہوتا ہے، کہ یہ دعا ایک تاریخی روایت پر مبنی ہے، چنانچہ لکھتا ہے :

تمام ایرانیوں کا اتفاق ہے کہ بیوراسف (ضحاک) نے ہزار سال کی عمر پائی، کہا جاتا ہے، کہ ایرانی ایک دوسرے کو جو ہزار سال تک زندہ رہنے کی دعا دیتے ہیں، اور کہتے ہیں، کہ "ہزار سال بزی"، اوس کی ابتدا اسی زمانے سے ہوئی، کیونکہ انھوں نے اس کو دیکھا تھا، اس لئے یہ اون کے نزدیک ممکن تھا، و اللہ اعلم(۲)!

مار ضحاک کی نسبت لکھتا ہے :

بیوراسف (ضحاک) کے دونوں شانوں کے متعلق کہا جاتا ہے کہ وہ اس کے شانوں کے درمیان ابھرے ہوئے تھے، اور انسانوں کا دماغ کھاتے تھے. اور کہا گیا ہے کہ یہ دو غدود تھے، جن میں درد پیدا ہوتا تھا، اور اون پر انسانی دماغ کی مالش کی جاتی تھی، جس سے اون کو سکون ہوتا تھا، لیکن دو سانپوں کا پیدا ہونا ایک عجیب چیز اور بہت مستبعد ہے، کیونکہ گوشت سے صرف کیڑے پیدا ہوتے ہیں(۳) *

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(۱) آثار الباقیہ صفحہ ۱۰۰ (۲) آثار الباقیہ صفحہ ۲۲۳ (۳) آثار الباقیہ صفحہ ۲۲۷

اسی طرح وہ جا بجا اور بھی بہت سی قدیم تاریخی روایتوں پر تنقید کرتا ہے، مثلاً یوم عاشوراء کے متعلق لکھتا ہے:

کہا جاتا ہے کہ اسی دن خداوند تعالیٰ نے حضرت آدم علیہ السلام کی توبہ قبول کی، اسی دن حضرت نوح علیہ السلام کی کشتی کوہ جودی پر ٹھہری، اسی دن حضرت عیسی علیہ السلام پیدا ہوئے، اسی دن حضرت موسی علیہ السلام اور حضرت ابراھیم علیہ السلام کو نجات ملی، اور اون پر آگ سرد ہوگئی، اسی دن حضرت یعقوب علیہ السلام کی بینائی واپس آئی، اور حضرت یوسف علیہ السلام کنوئیں سے نکالے گئے، اور حضرت سلیمان علیہ السلام کو سلطنت ملی، اور حضرت یونس علیہ السلام کی قوم سے عذاب اٹھا لیا گیا، اور حضرت ایوب علیہ السلام کے دکھہ کا خاتمہ ہوا، اور حضرت زکریا علیہ السلام کی دعا قبول ہوئی، اور ان کو حضرت یحیی علیہ السلام دیئے گئے، اور اسی دن فرعون کے جادوگروں کا مقابلہ ہوا *

ان تمام واقعات کو لکھکر وہ لکھتا ہے:

اس دن ان تمام اتفاقات کا جمع ہوجانا اگرچہ ممکن ہے، لیکن وہ عام محدثین اور اہل کتاب کی طرف منسوب ہے جنھوں نے علم کو اچھی طرح نہیں حاصل کیا ہے[1] *

غرض وہ قدیم تاریخی واقعات پر عقلی حیثیت سے نظر ڈالتا ہے، اور اسی حیثیت سے اون پر تنقید کرتا ہے، تاھم وہ بالکل عقل پرست بھی نہیں ہے، بلکہ ان ہی واقعات پر اور حیثیتوں سے بھی نظر ڈالتا ہے، مثلاً سلاطین فارس کی طویل العمری کے متعلق ایرانی تاریخوں میں جو دور از کار باتیں مذکور ہیں، اون کو اگرچہ وہ تسلیم نہیں کرتا، تاھم انسانی زندگی کا اوس نے کوئی خاص محدود معیار بھی قائم نہیں کیا ہے،

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(۱) آثار الباقیہ صفحہ ۲۲۹ - ۲۳

بلکه عقل پرستوں نے جو محدود معیار قائم کیا تھا، اوس کی تردید کی ہے، چنانچہ لکھتا ہے :

بعض مبتذل روایت پرستوں اور احمق دھریوں نے گذشتہ قوموں کی طویل العمری بالخصوص حضرت ابراھیم علیہ السلام کے زمانے سے پہلے کی عمروں کا انکار کیا ہے، اور ان کے اجسام کی جو بڑائی بیان کی گئی ہے، اوس کو ناممکن اور محال سمجھتے ھیں، اور اپنے زمانہ میں جو اجسام دیکھتے ھیں، اوسی پر ان کو بھی قیاس کرتے ھیں، اور احکام نجوم کے رو سے اون کے نزدیک انسان کی انتہائی عمر دو سو پندرہ برس تک ہوسکتی ہے، اور اس کی طبعی عمر صرف ایک سو بیس برس کی ہے، لیکن اگر حق اون کی خواھشوں کا پابند ھوجائے، تو آسمان و زمین تباہ ھوجائیں، صرف مشاھدہ اور اس پر قیاس کرنے سے طول عمر اور اشخاص کے جسم کی ضخامت کا اندازہ نہیں کیا جاسکتا، کیونکہ یہ چیزیں زمانوں میں مختلف طور پر پیدا ھوتی ھیں، اس لئے جب کوئی مشاھدہ کرنےوالا اون کی پیدایش کے اوقات کا مشاھدہ نہیں کرتا، تو اون کو مستبعد سمجھتا ہے، تمام کائنات یعنی جانور، درخت، تخم اور پھل سب کے سب اس میں داخل ھیں اگر کسی انسان کو ان کے حالات معلوم نہ ھوں، پھر اوس کو ایک ویران زمین درخت کی طرف لایا جائے، اور اوس سے یہ بیان کیا جائے کہ وہ سرسبز ھوجاسکے، اور اوس میں پھول پھل آئینگے تو وہ اس کو مستبعد سمجھےگا، یہاں تک کہ ان چیزوں کو دیکھ لے یہی وجہ ہے، کہ شمالی ملکوں کے لوگ جاڑے کے زمانے میں کھجور اور زیتوں کے درختوں کے سرسبز رھنے پر تعجب کرتے ھیں، کیونکہ انھوں نے اپنے ملکوں میں ایسے درخت نہیں دیکھے ھیں *

بعض چیزیں غیر منتظم دوروں میں صرف اتفاق سے پیدا ھوجاتی ھیں، اس لئے جب اس اتفاق کا دور گذر جاتا ہے، تو صرف اون کی روایتیں باقی رھجاتی ھیں اسلئے اگر روایت میں صحت کے شرائط موجود ھیں،

اور اس سے پہلے وہ خبریں ممکن نہیں، تو اوس کے قبول کرنے سے چارہ نہیں، گو اوس کی کیفیت اور علت نہ معلوم ہو *

اسی طرح بعض چیزیں فطرت کی غلطی سے پیدا ہوجاتی ہیں، کیونکہ اون کی نوع کا جو نظم ہے، اوس سے نکل جاتی ہیں، جیسا کہ بہت سے حیوانات میں زائد اعضا پائے جاتے ہیں *

اس کے بعد اس قسم کی بہت سی مثالیں دیگر لکھتا ہے۔

اس قسم کی تمام خبروں کے متعلق میں نے مخصوص کتابیں لکھی ہیں، جو اون لوگوں کے نزدیک مقبول نہیں ہیں، جنہوں نے ان کو نہیں دیکھا ہے، کیونکہ اون میں روایت کی صحت کے شرائط نہیں پائے جاتے *

فرغانہ اور تہامہ میں اس قدر طویل عمریں ہوتی ہیں، جو ان کے علاوہ دوسرے شہروں میں نہیں ہوتیں، اسی طرح عرب اور ہند کی عمریں بھی اون سے زیادہ ہوتی ہیں *

نباتات میں بھی یہ بات نمایاں طور پر نظر آتی ہے، بعض نباتات کی نوعیں دیر تک قائم رہتی ہیں، اور بعض جلد فنا ہوجاتی ہیں، اس لئے ان لوگوں نے اقوال نجوم سے جو استدلال کیا ہے، وہ باطل ہے *

ابو عبد اللہ الحسن بن ابراہیم الطبری النائلی کا ایک رسالہ میں نے عمر طبعی کی مقدار پر دیکھا جس میں اوس نے یہ بیان کیا ہے، کہ اوس کی انتہا ایک سو چالیس شمسی ہے، اس پر زیادتی ناممکن ہے، لیکن کلیۃً ناممکن کہدینے پر اسی دلیل کی ضرورت ہے، جس سے دل کو اطمینان ہو *

رہی اجسام کی ضخامت تو گو وہ ضروری نہیں، کیونکہ اس وقت اُوس کا مشاہدہ نہیں کیا جاتا، اور جس زمانہ کی نسبت یہ بیان کیا جاتا ہے، وہ بہت دور نکل چکا ہے، تاہم وہ محال نہیں ہے *

اگر انسانوں کے کسی گروہ کے اجسام بڑے نہ ہوتے تو اون کا ذکر
نہ تواتر کیوں کیا جاتا[1] *

بیرونی کو قدیم قوموں کے حالات اور عقائد و اعمال کے معلوم کرنے کا خاص طور پر شوق ہے، بالخصوص ایرانیوں کے مذہبی پیشواؤں کے حالات معلوم کرنے کا وہ خاص طور پر شائق ہے، اگرچہ اس سلسلہ میں اوس نے بہت سی سنی سنائی باتیں لکھدی ہیں، تاہم اوس نے اون کی اصلی کتابوں کا بھی پتہ لگایا ہے، اور ان کے ذریعہ سے اون کے عقائد و اعمال معلوم کئے ہیں، وہ اگرچہ خود اون کا ہمخیال نہیں ہے، تاہم محض علمی شوق سے اون کی کتابوں کا مطالعہ کیا ہے، چنانچہ اوس کے ایک دوست نے اوس سے محمد بن زکریا رازی کی کتابوں کی فہرست طلب کی ہے، اور اس نے اوس کے جواب میں اون کی فہرست بھیجی ہے لیکن اسی کے ساتھ اوس کے حالات سے اپنی براءت ظاہر کی ہے، اور لکھا ہے:

اگر میں تمہاری غرض نہ سمجھتا تو ایسا نہ کرتا، کیونکہ اوس کے مخالفین سے عداوت مول لینی پڑتی اور وہ یہ گمان کرتے کہ میں بھی اوسی کی جماعت میں داخل ہوں *

لیکن با ایں ہمہ بیرونی نے الہیات میں اوس کی کتابوں کا مطالعہ کیا تو معلوم ہوا کہ اوس کے خیالات مانی کی کتابوں بالخصوص سفر الاسرار سے ماخوذ ہیں، اس لئے اوس نے اپنے دوستوں سے اوس کتاب کا پتہ چلانا چاہا اور تقریباً چالیس سال تک اس جستجو و تلاش میں سرگرداں رہا، بالآخر ایک شخص نے اوس کو مانی کی بہت سی کتابیں دیں جن میں سفر الاسرار بھی تھی، اس پر بیرونی اس قدر خوش ہوا، کہ گویا ایک پیاسے کو آب زلال مل گیا ہے *

قدیم قوموں کے تاریخی حالات اگرچہ اور بھی بہت سی قدیم تاریخوں میں مذکور ہیں، تاہم اون کے مذہبی خیالات اور مذہبی عقائد و رسوم جس قدر بیرونی کی تصنیفات سے معلوم ہوسکتے ہیں، اور کسی کتاب سے نہیں معلوم ہوسکتے،

(۱) آثار الباقیہ ملخص از صفحہ ۸۲ تا صفحہ ۸۴

اوس نے آثار الباقیہ میں قدیم قوموں کے تہواروں وغیرہ کا باب تفصیل سے ذکر کیا ہے، اور ان کے مذھبی پیشواؤں کا حال لکھا ہے، ایک خاص فصل میں متنبیں نبی جعلی پیغمبروں کا حال لکھا ہے، اور اس سلسلہ میں مقنع کی نسبت لکھا ہے:

ماوراء النھر میں اوس کے پیرو ھیں جو مخفی طور پر اوس کے دین پر ھیں، لیکن اپنے آپ کو مسلمان ظاھر کرتے ھیں، اوس کے حالات کا میں نے فارسی سے عربی میں ترجمہ کیا، اور میری کتاب اخبار المبیضہ و القرامطہ میں یہ حالات تفصیل سے مذکور ھیں[1] *

اصل یہ ھے کہ قدیم قوموں اور مختلف فرقوں کے مذھبی حالات اور عقائد و رسوم اوس زمانے کے علم کلام کا ایک ضروری جزو تھے، اور اون سے یہ معلوم ھوسکتا تھا، کہ ایک قوم یا ایک فرقہ دوسری قوم یا فرقہ سے کس قدر متاثر ھوا ھے، اور ان حالات اور عقائد و رسوم میں بعد کے زمانہ میں کیا کیا تغیرات پیدا ھوئے ھیں، ملل و نحل کی کتابوں میں مختلف قوموں اور مختلف فرقوں کے جو حالات اور عقائد و رسوم بیان کئے گئے ھیں، اون کا یہی مقصد ھے، بیرونی کے دور سے پہلے اگرچہ عیسائیوں، یہودیوں اور پارسیوں کے عقائد و رسوم پر بہت کچھ لکھا جاچکا تھا، اور خود بیرونی نے آثار الباقیہ اور اپنی دوسری کتابوں میں ان پر بہت کچھ لکھا ھے، تاھم ھندوستان کے باشندوں پر کسی نے اس حیثیت سے نگاہ نہیں ڈالی تھی، عباسی دور میں اگرچہ بہت سی سنسکرت کی کتابوں کے ترجمے ھوچکے تھے، اور بہت سے ھندو پنڈت، ھندو وید اور ھندو فلاسفر دربار خلافت میں پہنچ چکے تھے، تاھم جن کتابوں کے ترجمے ھوئے تھے، وہ زیادہ تر طب، ریاضی، نجوم اور فلسفہ سے تعلق رکھتی تھیں، جن سے ھندوؤں کے مذھبی حالات عقائد، رسوم اور طرز معاشرت کا پتہ نہیں چل سکتا تھا، جو مسلمان بھی اگرچہ شوق علم میں ھندوستان آچکے تھے، لیکن انھوں نے بھی اس حیثیت سے ھندوستان کا مطالعہ نہیں کیا تھا، بیرونی پہلا شخص ھے، جس نے اس غرض سے ھندوستان کا سفر کیا اور ھمارے تذکرہ نویسوں کا

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(۱) آثار الباقیہ صفحہ ۲۱۱

بیان ھے، کہ اوس نے چالیس سال تک ھندوستان کی سیاحت کی، یہ مدت اگرچہ غیر تحقیقی اور مبالغہ‌آمیز ھے، تاھم اس میں شبہ نہیں، کہ وہ سنہ ۴۰۷ھ میں محمود غزنوی کے ساتھہ ھندوستان آیا، اور غزنہ ھی میں سنہ ۴۴۰ھ میں وفات پائی، اس لئے اوس نے اپنی عمر کا کافی حصہ ھندوستان میں بسر کیا، اور پنجاب اور سندھ کی سیاحت کرکے ھندوستان کا بچشم خود مشاھدہ کیا، سنسکرت زبان سیکھی، اور ھندوؤں کے علوم و فنون، عقائد و رسوم اور معاشرت و اخلاق پر کتاب الھند کے نام سے ایک ایسی کتاب لکھی جس کی نظیر اب تک موجود نہ تھی *

اوس کو اس راہ میں جو مشکلات پیش آئیں، اون کو سب سے پہلے اوس نے لکھا ھے :

(۱) ایک تو زبان سنسکرت کی مشکلات تھیں، جنھوں نے اوس کو فارسی اور عربی سے بیگانہ کردیا تھا، اور اس کا سیکھنا دوسروں کے لئے سخت مشکل تھا *

(۲) دوسرے اون کی علمی کتابیں زیادہ‌تر منظوم تھیں اور نظم کے تکلفات سے اون کے معانی و مطالب کا معلوم کرنا آسان کام نہ تھا *

(۳) تیسرے مذھبی اور قومی بیگانگی کہ اپنے سوا دوسری قوموں کو ملیچھہ یعنی نجس سمجھتے تھے، کہ اون کے ساتھہ اٹھنا بیٹھنا، کھانا پینا بالکل ناممکن تھا *

(۴) چوتھے یہ کہ وہ رسوم و عادات میں مسلمانوں سے بالکل مختلف تھے، یہانتک کہ مسلمانوں کی وضع و قطع سے اپنے بچوں کو ڈراتے تھے، اور ان کو شیطان سمجھتے تھے *

(۵) پانچویں محمد بن قاسم کے زمانہ سے محمود غزنوی کے زمانہ تک کی اسلامی فتوحات نے جن کی وجہ سے اون کا تمام علمی اور قومی شیرازہ پراگندہ ھوگیا تھا، ان کو مسلمانوں کا اور بھی زیادہ دشمن بنادیا تھا *

بیگانگی کے ان اسباب کے علاوہ ھندوؤں کا خیال تھا، کہ دنیا میں ھندوستان کے سوا نہ کوئی اور ملک ھے نہ ھندوؤں کے سوا اور کوئی قوم ھے، نہ ھندوؤں کے سوا

اور کوئی بادشاہ ھے، اور نہ ھندوؤں کے سوا کسی اور قوم کے پاس علم ھے، یہاںتک کہ خراسان اور فارس کے علم یا کسی عالم کا ذکر، اون سے کیا جاتا تھا، تو وہ اس کی تصدیق نہیں کرتے تھے، بلکہ اوس کو جھٹلاتے تھے، بیرونی اگرچہ اون کے پنڈتوں کی خدمت میں ایک شاگرد کی حیثیت رکھتا تھا، تاھم اوس نے جب اون کے علوم میں تھوڑی بہت مہارت پیدا کرلی، اور ان کے سامنے دلائل بیان کرنے شروع کئے، تو وہ اوس سے تعجب کے ساتھہ استفادہ کرنے لگے، اور پوچھنے لگے، کہ ھندوستان کے کس عالم سے تم نے یہ باتیں سیکھی ھیں. بیرونی اون کو حقارت سے دیکھتا تھا، تو وہ اوس کو جادوگر سمجھتے تھے، اور اپنے اکابر کے پاس اوس کو اپنی زبان میں بحر زخار کہتے تھے *

ھندوؤں میں دو طبقے تھے، خاص و عام، اور دونوں کے عقائد و خیالات اور اعمال مختلف تھے، جیساکہ عیسائیت کے ظہور سے پہلے یونانیوں کی بھی یہی حال تھا، لیکن بعد کو جو یونانی حکماء پیدا ھوئے انھوں نے یونانی عقائد، یونانی رسوم اور یونانی علوم کو عوام کے خیالات سے پاک کردیا، لیکن ھندوؤں میں اس قسم کے حکماء نہیں پیدا ھوئے، اس لئے ھندوؤں کے عقائد و خیالات میں اوھام و خرافات کی بہت زیادہ آمیزش ھوگئی، اور بیرونی نے ایمانداری کے ساتھہ ان کو بغیر تنقید کے نقل کردیا، تاھم اوس نے جو کچھہ لکھا ھے، اوس سے خواص کا نقطۂ نظر بھی معلوم ھوجاتا ھے *

مثلاً خداوند تعالیٰ کی ذات کے متعلق پہلے تو اوس نے خواص کے عقائد لکھے ھیں، اس کے بعد لکھا ھے :

اگر ھم ھندوؤں کے خواص کے طبقہ کو چھوڑکر، اون کے عوام پر نظر ڈالیں تو اون کے اقوال مختلف اور بدنما ھوجائینگے، جیساکہ تمام مذاھب بلکہ خود اسلام میں بھی تشبیہ وغیرہ پائی جاتی ھیں، ھندوؤں کے بعض خواص خدا کو نقطہ کہتے ھیں، تاکہ اجسام کے اوصاف سے اوس کو بری کریں، اس کے بعد عوام کو یہ معلوم ھوا تو انھوں نے خیال کیا کہ چھوٹا ھوتا

حدا کی عظمت پر دلالت کرتا ہے، اس لئے انہوں نے یہ عقیدہ قائم کرلیا
کہ وہ ۱۲ اونگل لمبا اور دس اونگل چوڑا ہے *

یا یہ کہ جیسا کہ ہم نے بیان کیا ہے، کہ خدا ہر چیز پر محیط ہے، اوس سے کوئی چیز چھپ نہیں سکتی، اس سے عوام نے یہ عقیدہ قائم کرلیا، کہ احاطہ، دیکھنے سے ہوتا ہے، اور دیکھنا آنکھ سے، اور دونوں آنکھیں اندھے پن سے افضل ہیں اسلئے انہوں نے خدا کے لئے ایک ہزار آنکھیں تسلیم کرلیں، جس سے کمال علم مراد ہے، اس قسم کے خرافات اون کے یہاں موجود ہیں، بالخصوص اون طبقات میں جو علم نہ حاصل کرسکے[1] *

بیرونی صرف ہندوؤں ہی کے عقائد و خیالات کے نقل کرنے پر اکتفا نہیں کرتا، بلکہ دوسرے مذاہب کے عقائد و خیالات بھی نقل کرتا ہے، جس سے نہایت مفید باتیں معلوم ہوتی ہیں، مثلاً ایک موقع پر لکھتا ہے:

اُبوہ اور بُنوہ کے لفظ کی اسلام اجازت نہیں دیتا. کیونکہ ولد اور ابن عربی زبان میں ایک ہی معنی میں بولے جاتے ہیں. اور والد اور ولادت کا لفظ ربوبیت کے معنی سے منافی ہے، لیکن عربی زبان کے علاوہ اور زبانوں میں اس کی گنجائش ہے، یہاں تک کہ اون میں باپ کے ساتھ خطاب کرنا، آقا کے ساتھ خطاب کرنے کے معنی میں آتا ہے، اسی لئے عیسائیوں میں جو شخص اب اور ابن نہیں بولتا وہ اون کی ملت سے نکل جاتا ہے. ابن کا لفظ حضرت عیسیٰ علیہ السلام کے متعلق خصوصیت کے معنی میں مستعمل ہے، اور وہ صرف انہی تک محدود نہیں بلکہ اون کے علاوہ اور لوگوں پر بھی شامل ہے، وہ خود اپنے تلامذہ کو دعاؤں میں یہ سکھاتے ہیں، کہ کہو "اے میرے باپ جو آسمان میں ہے"[2] *

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(۱) کتاب الہند صفحہ ۱۵ (۲) ایضاً صفحہ ۱۸

بیرونی نے اگرچہ کتاب الھند میں صرف ھندوؤں کے عقائد و خیالات لکھے ھیں تاھم جا بجا ضمناً ایسی باتیں بھی لکھہ جاتا ھے، جس سے معلوم ھوتا ھے، کہ ھندو مذھب کا، دنیا کے اور مذاھب پر کیا اثر پڑا ھے، چنانچہ تناسخ کے متعلق لکھا ھے کہ

مانی ایران شہر سے جلا وطن کیا گیا، تو ھندوستان میں آیا اور ھندوؤں سے تناسخ کے مسئلہ کو اپنے مذھب میں منتقل کرلیا(۱) *

اسی بحث میں دوسرے موقع پر لکھا ھے :

پروقلس کہتا ھے کہ یاد کرنا اور بھولنا نفس ناطقہ کا خاصہ ھے اور یہ بات ظاھر ھوچکی ھے کہ وہ ھمیشہ موجود رھی ھے اس لئے وہ ھمیشہ جاننے والی اور بھولنے والی بھی ھوگی، جب وہ بدن سے الگ ھوگی، تو جاننے والی ھوگی اور جب بدن سے ملیگی تو بھولنے والی ھوگی. کیونکہ بدن سے جدا ھونے کی حالت میں وہ حیز عقل میں ھوگی، اس لئے جاننے والی ھوگی، اور بدن سے ملنے میں وہ اوس سے نیچے اوتر آئیگی، اس لئے اوس کو نسیان عارض ھوجائیگا، بعض صوفیہ کا جو یہ قول ھے کہ دنیا سونے والی نفس اور آخرت جاگنے والی نفس ھے اوس سے یہی مراد ھے، صوفیہ چند مقامات مثلاً آسمان، عرش، اور کرسی میں خدا کے حلول کو جائز سمجھتے ھیں اور بعض صوفیہ تمام عالم، حیوان، درخت اور جماد میں حلول کو جائز خیال کرتے ھیں اور اس کی تعبیر ظہور کلی سے کرتے ھیں، اور جب وہ اس کو جائز سمجھتے ھیں تو تناسخ کے ذریعہ سے حلول ارواح میں اون کے نزدیک کوئی ممانعت نہیں(۲) *

ھندوؤں کے اصلی عقائد و خیالات میں جیسا کہ اوپر گذرا بہت سے اوھام و خرافات مل گئے ھیں، لیکن بیرونی نے ھندوؤں کی اصلی کتابوں کو پیش نظر رکھکر ان اوھام و خرافات کا پردہ چاک کردیا ھے، چنانچہ دنیا سے نجات حاصل

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(۱) کتاب الھند صفحہ ۲۷ (۲) ایضاً صفحہ ۲۹

کرنے کے طریقہ پر ہندوؤں کے اصلی عقائد و خیالات پر اوس نے نہایت تفصیل سے بحث کی ہے، اور اس کے بعد لکھا ہے:

> نظر و تحقیق کے بعد یہ باتیں اون کے کلام سے ظاہر ہوتی ہیں، لیکن خبر و روایت کے طریقہ کے موافق جس میں کثرت سے خرافات شامل ہوجاتے ہیں، اون کا ذکر درمیان کلام میں آجائیگا[1] *

آج ہندوؤں کی جو عام مذہبی حالت ہے اوس کو دیکھکر ہر شخص یہ فیصلہ کریگا کہ ہندوؤں کا اصلی مذہب بت پرستی ہے، لیکن بیرونی نے جہاں ہندوؤں کے بتوں پر بحث کی ہے، وہاں صاف تصریح کردی ہے، کہ یہ ہندوؤں کے عوام کا مذہب ہے، خواص اور محققین صرف توحید کے قائل ہیں، چنانچہ لکھا ہے:

> چونکہ ہم صرف وہ باتیں بیان کرتے ہیں، جن کے ہندو معتقد ہیں، اس لیے اس معاملہ میں اون کے خرافات بیان کرتے ہیں، لیکن ہم یہ بھی بتائے دیتے ہیں، کہ یہ ہندوؤں کے عوام کا اعتقاد ہے، لیکن جو شخص نجات کے طریقے ڈھونڈتا ہے، یا بحث و کلام کے طریقوں کا مطالعہ کرتا ہے اور اوس حق کا طالب ہے، جس کا نام اون لوگوں نے سار رکھا ہے، وہ خدا کے سوا اور کسی کی پرستش سے بری ہے، چہ جائیکہ اوس کی مصنوعی صورت کی پرستش[2] *

بیرونی نے ہندوستان کی سیاحت کے زمانے میں اسلامی علوم و فنون کی جو اشاعت کی اوس کا پتہ کتاب الہند سے چل جاتا ہے، اوس نے اس سلسلہ میں سب سے بڑی کوشش تو یہ کی کہ ہندو مسلمانوں کے علوم و فنون سے واقف ہوں، اور اس راہ میں اوس کو بڑی مشکلات پیش آئیں، چنانچہ لکھتا ہے:

> زیادہ تر ہندوستان کے لوگ نظم پر فریفتہ ہیں، اور نثر کی طرف گو اوس کا جاننا آسان ہے، راغب نہیں، اون کی زیادہ تر کتابیں اشلوک میں ہیں، چونکہ میں اشاعت علم کا حریص ہوں، اور چاہتا ہوں، کہ جو علوم

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(۱) کتاب الہند صفحہ ۲۶ (۲) ایضاً صفحہ ۵۴

اون کے یہاں نہیں ھیں ، وہ اون میں رائج ہوں، اس لئے میں نے اوقلیدس کی کتاب اور محسطی کا ترجمہ اور صنعت اصطرلاب کا املا کرانا چاہا تو اُس کی وجہ سے مصیبتوں میں مبتلا ہوگیا[1] *

بہر حال باوجود ان دشواریوں کے، اوس نے ہندوؤں میں مسلمانوں کے علوم و فنون کی اشاعت کی، اسی طرح اوس نے مسلمانوں کو بھی ہندوؤں کے علوم و فنون سے بیگانہ نہیں رکھا، بلکہ ہندوؤں کی کتابوں کے بھی عربی میں ترجمے کئے چنانچہ لکھتا ھے :

اس فن میں براھمہر کی دو چھوٹی بڑی کتابیں ھیں جن کی تفسیر بلبھدر نے کی ھے اور ان میں چھوٹی کتاب کا ترجمہ میں نے عربی میں کیا[2] *

افسوس ھے کہ بیرونی کو تمام علوم و فنون میں ہندوؤں کی کتابیں نہ مل سکیں ورنہ اگر اوس کو ان کتابوں کے پڑھنے اور ترجمہ کرنے کا موقع ملتا، تو اوس کے دور سے پہلے ہندوؤں کی جن کتابوں کے ترجمے ہوچکے تھے، اون کی بہت سی غلطیاں ظاہر ہوجاتیں، چنانچہ ایک موقع پر لکھتا ھے :

ہندوؤں کے اور بھی بہت سے علم ہیں اور بےشمار کتابیں ھیں، لیکن میں اون سے واقف نہ ہوسکا، اور میری خواہش نہ ھے، کہ میں کتاب پنج تنتر کا جو ہمارے یہاں کلیلہ و دمنہ کے نام سے مشہور ھے، ترجمہ کرسکتا، اوس کا سب سے پہلے ہندی سے فارسی میں، پھر فارسی سے عربی میں ترجمہ ہوا، اور ایسے لوگوں نے ترجمہ کیا جن کی تغییر و تحریف کا خوف ھے، مثلاً عبد اللہ بن مقفع نے اس میں برزویہ کے باب کا اضافہ کردیا، تاکہ دینی عقیدہ میں شک پیدا کردے اور مذہب مانیہ کی دعوت دے، کیونکہ اوس نے جو اضافہ کیا اوس میں وہ متہم تھا[3] *

بیرونی جس زمانے میں ہندوستان میں آیا ھے، وہ تمدنی اور معاشرتی حیثیت سے ہندوؤں کا دور وحشت و جہالت تھا، لیکن اوس نے اس دور کی تمدنی و معاشرتی حالت

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(۱) کتاب الہند صفحہ ٦٦ (۲) ایضاً صفحہ ٧٥ (۳) کتاب الہند صفحہ ٧٦

حو لکھی ھے، اوس سے ھندوؤں کی نقص اور مسلمانوں کا تفوق ظاهر کرنا مقصود نه تھا، بلکه ھندوستان کی تمدنی و معاشرتی زندگی کا صحیح نقشه کھینچنا مقصود تھا، چنانچه ھندوؤں کی تمدنی و معاشرتی زندگی کا حال لکھکر اخیر میں لکھا ھے :

میں صرف ھندوؤں ھی کے دور جاھلیت پر سرزنش نہیں کرتا، عرب میں بھی اس قسم کی برائیاں موجود تھیں، لیکن اسلام نے اون کو مٹادیا، جیساکه ھندوستان کی اکثر باتوں کو اون لوگوں نے مٹایا جنھوں نے یہاں اسلام قبول کیا[1] *

بہر حال اگرچه اس کتاب میں اوس نے زیادہتر ریاضی اور ھیئت کے مسائل پر بحث کی ھے، تاھم بہت سی فصلوں میں ھندوؤں کے مذھبی عقائد و اعمال بھی نہایت تفصیل سے لکھے ھیں، اور اس سے ھندو مذھب کی تاریخ پر کافی روشنی پڑتی ھے *

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(۱) ایضاً صفحه ۹۱

ALBERUNI AS A THINKER*

By

ARTHUR UPHAM POPE

Alberuni must rank high in any list of the world's great scholars No history of mathematics, astronomy, geography, anthropology, or history of religion is complete without acknowledgment of his immense contribution One of the outstanding minds of all time, distinguished to a remarkable degree by the essential qualities which have made possible both science and social studies, Alberuni is a demonstration of the universality and timelessness of a great mind One could compile a long series of quotations from Alberuni written a thousand years ago that anticipate supposedly modern intellectual attitudes and methods

A satisfactory appraisal of his work as an historian of Indian myth, religion, the natural sciences, and social forms of the period can only be done by specialists, but the man's character, and the quality of his mind all can appreciate and profit by

The range of his learning was prodigious, particularly for an age when there was no mass publication of books, no scientific journals no rapid distribution of the knowledge that was available A persistent and omnivorous curiosity, thoroughness, industry, systematic planning, and the open mind garnered for his intellectual treasury about all that could be learned in his day He was familiar with Greek science and philosophy (he quotes Plato twenty-three times), was deeply grounded in Arabic history and science knew and could use with both piety and effectiveness the Koran and its commentaries

As historian Alberuni was pre-eminent Any good historian needs to be soundly grounded in geography Alberuni understood this, and his geographical reports are first class Whether discussing location, direction, distances, coastal configuration river courses, or rainfall, he was comprehensive systematic and precise his terms clearly defined, and as usual the facts made contributions to fuller understanding of the human factors His description of how a vapor-charged cloud is condensed by contact with a steep mountain slope is perfectly correct and represents an extension beyond factual description to understanding

While Alberuni faithfully holds to facts and is specific and careful in his descriptions, he always understands that both history

* The page references are to Edward Sachau's *Alberuni's India*

and science have to go beyond fact and that understanding does not emerge from an inventory but from interpretation that is only possible by general principles Moreover, he must use other techniques than the mere recital of fact He shows a real interest in the meaning and derivation of words where they can throw light on any problem He understood that history was far more than a series of events and that any true history had to be history of ideas and institutions Accordingly, he must give detailed and penetrating accounts of religion in India, and any account of Indian religions without an understanding of the philosophies involved would have been hopelessly uperficial Alberuni had to understand what he was writing about He had to be a philosopher in order to write the history of philosophy, and his definition of problems, his comments on their solutions show that in this field alone he was one of the great minds of the time

Politically and economically a large area of the world had been becoming one under the expansion of Islam a unity which with immense effort, observation, judgment was being systematically recorded by the great Arab geographers But Alberuni's report on India is more comprehensive, systematic and specialized than any preceding report on a foreign land, not except the great records of the early Chinese Buddhist pilgrims Huan Tsang and Fa Hsien

There was more than mere curiosity in this work Alberuni is consciously building up the possibility of understanding, communication, and co-operation with a sharply contrasting civilization He claims to have provided sufficient information 'for anyone who wants to converse with the Hindus and to discuss with them questions of religion science or literature,' then he adds significantly—'on the basis of their own civilization' (II, 246) In short, he saw clearly that cultural interchange was something far more than mere information or external description

Alberuni exemplified all the essential qualities of a great scientist in the broadest sense, notably a burning curiosity which was disciplined and sustained, a love of truth that was sovereign in all his thinking 'We ask God to pardon us for every statement of ours which is not true' (II, 246), and unusual specificity—his reports like his thinking are pointed and definite, but there are other scientific requirements which we are apt to think more modern than they are a healthy scepticism ready always to test all assertions, a resolute effort at objectivity, a refusal to be beguiled by plausibility or romantic charm unless supported by proof Concerning some rather tall stories about charms for snake bites he says, 'I for my part do not know what to say about these things, as I do not believe them' (I, 194) Nonetheless he felt it necessary to set down accurately and faithfully even the most fantastic tales and the

most peculiar customs Yet, so strong is his faith in reason and his repugnance to the incoherent, capricious, or merely peculiar, that he resolutely looks for some natural explanation that will relate the isolated phenomena to a more inclusive set of facts and principles Like a true scientist, Alberuni insists on the necessity of observation and experiment and is scornful of those who uncritically merely repeat tradition

He is as free as any ancient writer could be from the taint of propaganda or proselytizing, exemplifying that faith in fact and reason which are the presumptions of all good scholarship Many of the things that he had to report seemed to him absurd, and not a few he found socially and religiously offensive, but he includes them in his account with obvious efforts to be fair and accurate

He does not wholly escape as does no one, intolerance, and sometimes his scorn is unjustifiable and occasionally his religious convictions and resultant partisanship get the better of him Referring to Mani and Manichaeism, he asserts that 'all their beautiful books were intended for deliberate deception' (I, 264), and this is more than a little extravagant, but here as in other comparable passages, Alberuni is protesting against sectarianism He believed that the Koran was, in all essentials, in perfect harmony with other religious codes' (a view to which he was committed by his conviction of the universal validity of reason) and he was convinced that the purity of Islamic doctrine had been corrupted, both within and without by ignorant, selfish and ambitious men

This is one of the earliest statements of belief in the essential unity of all religions in their major precepts If religious partisanship is persisted in, he believes that we may easily decline from the straight path of honor and duty' (Vol I, p 264)

This confidence that knowledge is one, and that with patience and care agreement can be reached, a point of view that is frequently affirmed and also implied throughout Alberuni's work, is a postulate that is fundamental to modern science In Alberuni's scholarship it is both the ground and a consequence of his skilful use of the comparative method He constantly expounds Greek views, and adds 'It is precisely the same with the Hindus' And to such comparisons he often adds views of Persians, Jews and Arabs Or again, he finds the doctrine of Patanjali comparable to Sufi doctrines, with which it proves to be in complete accord He checks one account against another, stating them both fairly In all his social studies particularly Alberuni uses the comparative method with great effect, thus overcoming the bewilderment that the more curious customs seen by themselves engender In comparing the marriage customs of the Hindus, he compares not merely various Hindu communities, but the customs of the Arabs, Persians and Tibetans (I, 109)

In all his reports of Hindu doctrine, Alberuni is conscientious about his sources and honest in his appraisal of their, or his own, deficiencies He has occasion to state Buddhist views on subjects like Mount Meru, but he frankly says, 'I have never found a Buddhist book and never known a Buddhist from whom I might have learned their theories on this subject All I relate of them I can only relate on the authority of Aleranshari though according to my mind his report has no claim to scientific exactness nor is it the report of a man who has scientific knowledge on the subject' (I, 249)

He is equally frank about difficulties due to translation or to confusion in the views that he is discussing Thus he says of a remark of Brahma Gupta on Mount Meru 'I for my part have no means of arranging this erroneous sentence in a reasonable shape' (II, 83) And again referring to Brahma Gupta's work he says 'There seems to be some confusion in this chapter perhaps by the fault of the translator' (I, 277) Similarly in his effort to be clearly understood, he states 'In case, however, one word or other in our translation should be used in a meaning different from that which it generally has in our sciences, we ask the reader to consider only the original meaning of the word (not the technical one), for this one is meant' (I, 266)

Alberuni, in accord with modern philosophical and mathematical procedure tests the truth of assertions by first developing their implications then testing these implications for consistency and reasonableness

Concerning the revolution of the earth round the sun he says 'This one is more difficult to solve', and with a confidence which a scientist often shows when he is sure that he has hold of something solid, he adds that the question has been deeply studied by both modern and ancient astronomers and remarks 'We, too, have composed a book on the subject, called "Key of Astronomy," in which we think we have surpassed our predecessors, if not in the words, at all events in the matter' (I, 277)

Like any good modern scientist, he is scornful of pseudo-science, and particularly contemptuous of any who, like some of the Hindu princes of his day, were, in their greed for gold, spending a lot of effort on a kind of alchemy from which they hoped to acquire limitless riches Alberuni adds 'If this precious science of Rasayana were banished to the utmost limits of the world, where it is unattainable to anybody, it would be the best' (I, 193) 'Alchemy is a make-believe science' (I, 188), motivated simply by 'excessive eagerness for acquiring fortune and for avoiding misfortune' But he also says 'No nation is entirely free from it' and 'many intelligent people are entirely given to alchemy' (I, 188) It was seven hundred years after these shrewd remarks before Europe gave up its pursuit of alchemy

The conception of science underlying all his work is sound and again astonishingly modern He assumes the reign of law and uniformity, and that all judgment of magnitude, position and movement are subject to the authority of mathematical analysis

He is aware of the compromises that result from the contrast and conflict between scientific knowledge and popular opinion and the danger of pressure from popular opinion, particularly of religion on science ' the astronomers require them by accepting their popular notions as truth, by conforming themselves to them, however far from truth most of them may be, and by presenting them with such spiritual stuff as they stand in need of This is the reason why the two theories, the vulgar and the scientific, have become intermingled in the course of time, why the doctrines of the astronomers have become disturbed and confused .' (I, 265)

If we knew less about the Islamic world at this period, we would be inclined to see in Alberuni's character and achievement a conspicuous confirmation of the 'great man theory' that it is the exceptional man endowed with uncommon intelligence and powerful and persistent will who impresses himself on his time and deflects the course of affairs But every genuinely great scholar has struck deep and nourishing roots into the past, and his greatness often consists in the selectivity and comprehensiveness with which he has focused and integrated in his own personality the achievements and creative tendencies of his own age In the ninth and tenth centuries (A D) in Islam, a great page was written in the history of civilization The Persian contribution was particularly brilliant Al Razi, Rudagi, Firdausi, Kabus ibn Washimgir, Avicenna, and a host of productive and provocative minds, of which we know too little, all came out of the same background as Alberuni They all had important traits in common

According to the Traditions, the Prophet said 'Seek ye knowledge even to China', and the intellectual zest of Iran was a parent of much fervent and true thought It was this cultural ambience that nourished and sustained Alberuni, and the crucial character of the time gave him fortunate opportunities for his great talents to operate effectively

He was of his time, yet nonetheless a supremely great individual His humor, his courage, his enterprise, his objectivity, his honesty, his prodigious industry, and his technical intellectual skills were nothing that happened automatically They were Alberuni himself

AL-BĪRŪNĪ AND ORIENTALISTICS

By

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Al-āthār'l-bāqiya and *Ta'rikh'-l-Hind* show al-Bīrūnī as a worker in the field of orientalistics in the modern sense In preparing them he was not actuated by any personal motives, but solely by the desire for knowledge about peoples of various countries and religions different from his own, and that out of pure intellectual curiosity of finding out the truth, be it pleasant or not

Al-āthār'l-bāqiya contains a mass of useful and even unique information about Iranian antiquities, for instance, about religious customs amongst Zoroastrian communities in different provinces like Sughd and Khwarizm The local names of months, festivals, etc, give us also some insight into the characteristic traits of their dialects, thus helping us to identify the middle Sogdian texts in the manuscripts discovered from Turfan and Khwarizmi noticed elsewhere When Sachau prepared the text and translation of *Al-āthār*, the MSS at his disposal were defective, but now the complete ones have been brought to light This new material requires to be worked out and also the old one is not quite exhausted But as the work is not accessible to me I cannot give any examples to the point

Ta'rikh'l-Hind has got another type of interest for us A detailed commentary on the facts about Indian antiquities recorded in this work would not be superfluous By way of illustration I may dwell upon a few details

While speaking of the Rgveda al Bīrūnī remarks

> P 128 'It treats of the sacrifices to the fire, and is recited in three different ways First, in a uniform manner of reading, just as every other book is read Secondly, in such a way that a pause is made after every single word Thirdly, in a method which is the most meritorious and for which plenty of reward in heaven is promised First you read a short passage, each word of which is distinctly pronounced then you repeat it together with a part of that which has not yet been recited Next you recite the added portion alone, and then you repeat it together with the next part of that which has not yet been recited, etc Continuing to do so till the end, you will have read the whole text twice '

The first statement, now, can be said to refer to the fact that all the so-called Family Books (2–7) as well as the first one open with the hymns to Agni or fire Of course, we cannot say whether the above conclusion was drawn by al-Bīrūnī from the reports given to him by some native scholar or the same was presented to him by the latter The same doubt remains as regards the account about the recitation Al-Bīrūnī may have actually heard and observed the recital, or may have read about it in some works, or may have received oral information In any case, the first two modes of recital are clear They refer to the Samhitā-pātha and Pada-pātha respectively The third is not quite properly represented, but it certainly refers to the Krama-pātha in which the words are recited ab, bc, cd, and so forth Instead of individual words, al-Bīrūnī speaks of 'short passages' This is of course a slight oversight or misunderstanding But why and where this mode of recital is said to be meritorious, I do not know—as to why, perhaps because it is so difficult and complicated In a recent article on the subject there is nothing about this meritoriousness, as a matter of fact nothing new about the whole subject of recitation itself, with the exception of the interesting notice about the feats of a modern Pandit, who has all the three modes of recitation by heart and also various other details about the Rgveda (Annals, Bhandarkar Or Res Institute 28, 140)

The story given by al Bīrūnī about the reason why the Ṛgveda cannot be recited as a text connected by the rules of Samdhi, refers, I believe, to the Pada-pātha, but its source is unknown to me The legend in Visnu Purāna 3 5 varies in various respects, it is about learning the Yajur-Veda, for instance Other details are not so remarkable, and even the above ones may be considered puerile and not worth attention, yet I think they have some value as to how Indian antiquarian details were presented to al-Bīrūnī or how he grasped them They may also point to a different tradition of a matter or a different version of a story Hence by way of example I may refer to the ambiguous answer given by Yudhisthira, his only departure from truth, which has even resulted in proverbial sayings In al-Bīrūnī's version of the story, the answer is said to be 'Aśvatthāman, the elephant, has died', but it is added, Yudhisthira 'had made a pause between Aśvatthāman and the elephant, by which he had led Drona to believe that he meant his son' In the Mahābhārata (Drona-Parva 191 57), however, we are told that the word elephant (*kuñjara*) was added indistinctly (*avyaktam*) Is it possible that the difference has arisen from the fact that some languages have one and the same word for 'low' (soft, not loud) in tone and 'slow' in time? I remember how an oriental mixed up 'leise' and 'langsam' in German quite promiscuously or rather preferring the latter Of course, one must consult the original Arabic for such minute details and points

of niceties The event or anecdote is referred to in various other places, hence varying versions are not out of the question either In Gujarat, for instance, even the phrase *naro vā kuñjaro vā* 'either the man or the elephant' is attributed (mark that *nar* is declined thematically)

Then there occur also notices on beliefs and customs of other peoples These are referred to by al-Bīrūnī for the sake of comparison and elucidation just as a modern scholar does Sachau has prepared a separate Index to them, and so one can study any or a particular group of them For the present a few remarks will suffice

Page 21 The statement 'There are some Magians up to the present time in India, where they are called Maga' seems to me out of place Before and after it al-Bīrūnī speaks of Buddhists and Hindus, and I think the statement ought to refer to the Buddhists Moreover, Magas were, strictly speaking, not Magians or orthodox Zoroastrians, but a sun-worshipping tribe of Iranian extraction with some Iranian customs If, however, al-Bīrūnī does mean Magians or Zoroastrians then he must be referring to some Parsi colonies in Sindh and the Punjab like that at Uch, about which see my article 'Zur Pflege des iranischen Schrifttums im Mittelalter', *ZDMG* 98, pp 294 ff, especially pp 309 ff —Parsen-Kolonie in Uč, Sind-Punjab

Page 54 f The remarks about body and soul from Mani s Book of Mysteries are very interesting I hope to return to them in my study on the Manichean fragment S 9

Page 100 The four classes of Iranian Society are based upon the actual state under the Sasanids, hence they resemble the accounts in other historical works and not that in the religious literature of the Parsis which mechanically repeats the more ancient state of affairs

Page 109 Details about a man's being married as the substitute for another man' will clear up some of our false notions about marriages among ancient Iranians

Page 158 While giving the title *Sārāvalī*, of a Hindu work on astrology, al-Bīrūnī adds 'similar to *Vazadaj*' which Sachau equates with 'Persian *guzīda*?', thus with a mark of interrogation or doubt But the term is really Persian—*vizīdaj* representing the later Middle Persian pronunciation *vizīdag*, the earlier one would be *vičītak* selected selection' This should be the meaning of the Arabic explanation which Sachau has rendered with 'chosen one' The Sanskrit title, which is very common, is made up of *sāra*' essence, substance, and *āvalī* 'row, series, etc ' The comparison by al-Bīrūnī is really remarkable It suggests that he must have met with a considerable number of older Persian books bearing that Middle Persian title Here is another proof of the existence of a

vast secular and even scientific literature in pre-Islamic Persia Very probably it was more or less extant up to the days of al-Bīrūnī and even a little later The adoption of Arabic as the language of science and literature caused its gradual decay, which decay was crowned very probably by the *coup d' état* delivered by the Mongol invasion Barthold may well try to remove the charge of ruthless destruction against the Mongols, so vehemently and eloquently laid by Browne, as far as the Islamic science and letters are concerned, but I believe there is still enough truth in that charge Zoroastrians too failed to preserve their entire religious literature only after this epoch For we know for certain that even up to the tenth century a considerable part of it was extant and selections and summaries were prepared from it To return to the point of our departure I may add that one such work bears the same title as referred to by al-Bīrūnī It is the well known *Vičitakīhā ī Zātspram*

Page 260 The remarks about confusing two countries under the name of the land of five or seven rivers deserves further investigation

Lastly I may refer to one point from the second volume, p 167 The bodies of the dead are said to be exposed to the wind Is there any connection with the wind God, Vayu, who once played the rôle of the chief God and is still known as the God of death?

It goes without saying that this varied and various mass of details referred to by al-Bīrūnī cannot be satisfactorily dealt with by a single individual, however learned and well read he may be Sachau no doubt has achieved a masterpiece, yet not only the obscurity and difficulty of Arabic may well necessitate a new attempt but also the commentary should be revised and enlarged This task should be undertaken with all due care and co-operation at least of a Sanskritist or rather Sanskritists, for al-Bīrūnī traverses a vast field of some 80 subjects

There is another task which equally deserves to be undertaken A critical edition of the author's *Tafhīm* in Persian will provide us a good specimen of early prose in this language

A few words on the name of this remarkable and almost unique scholar and I have done with these ramble notes and stray thoughts upon him The full name is Abū Raihān al-Bīrūnī Bīrūnī is a Persian word meaning 'of or belonging to the outside (*bīrūn*), in this case the outside or outskirts of the city Khiva Sachau writes *Berūnī* in accordance with the older pronunciation of *bē* 'out', but then one must be consequent and adopt also *rōn* 'side', as some have actually done (*cf* also Master *Alıboron* used in the West) It is under this name or so to say surname that this renowned scholar of ancient times is known to us moderns Formerly among his compatriots he was generally referred to as Abū Raihān If I am right in my conjecture the great romantic poet Nizāmī refers to our

scholar as well as to the literal meaning of the term *raihān* in his Haft Paikar, in the story of the Russian Princess. I cannot cite the exact verse, as neither this work nor my article on it in Or. Lit. Zeitung is accessible here. My conjecture was based upon the variants given in the edition by Ritter and Rypka.

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The following Index is not exhaustive but suggestive only of the subject matter found in the volume The text of the numerous quotations has not been surveyed The titles of books when given are in italics The spelling or transliteration used by the authors of the articles have generally been retained The capital letter M stands for *Muhammad* and the letter b for *ibn* The Persian and Urdu papers (pp 237–279) are covered by a separate Index in Persian script

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